A CROSS SECTIONAL STUDY ON THE PREVALENCE OF HEARING LOSS AMONG AUTOMOBILE INDUSTRIAL WORKERS IN KANCHEEPURAM DISTRICT, TAMIL NADU-2017

Dissertation submitted to

THE TAMILNADU DR. MGR MEDICAL UNIVERSITY

In partial fulfillment of the requirements for the degree of

M.D. BRANCH XV

COMMUNITY MEDICINE

THE TAMIL NADU Dr. MGR MEDICAL UNIVERSITY,

CHENNAI, TAMILNADU.

MAY – 2018

CERTIFICATE

This is to certify that the dissertation titled **"A CROSS SECTIONAL STUDY ON THE PREVALENCE OF HEARING LOSS AMONG AUTOMOBILE INDUSTRIAL WORKERS IN KANCHEEPURAM DISTRICT, TAMIL NADU-2017"** is a bonafide work carried out by **Dr.E.S.AMARNATH**, Post Graduate student in the Institute of Community Medicine, Madras Medical College, under my supervision and guidance towards partial fulfillment of the requirements for the degree of M.D. Branch XV Community Medicine and is being submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai.

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CERTIFICATE OF THE GUIDE

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CERTIFICATE – II

This is to certify that this dissertation work titled **"A CROSS SECTIONAL STUDY ON THE PREVALENCE OF HEARING LOSS AMONG AUTOMOBILE INDUSTRIAL WORKERS IN KANCHEEPURAM DISTRICT, TAMIL NADU-2017"** of the candidate **Dr.E.S.AMARNATH**, with registration Number **201525002** for the award of **M.D. COMMUNITY MEDICINE** in the **BRANCH XV**. I personally verified the urkund.com website for the purpose of plagiarism Check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows **5 percentage** of plagiarism in the dissertation.

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DECLARATION

I solemnly declare that the dissertation titled **"A CROSS SECTIONAL STUDY ON THE PREVALENCE OF HEARING LOSS AMONG AUTOMOBILE INDUSTRIAL WORKERS IN KANCHEEPURAM DISTRICT, TAMIL NADU-2017"**was done by me under the guidance and supervision of **Dr.T.S.SELVAVINAYAGAM**, Director, Institute of Community Medicine, Madras Medical College, Chennai-3. The dissertation is submitted to The Tamil Nadu Dr. M.G.R. Medical University towards the partial fulfilment of the requirement for the award of M.D. Degree (Branch XV) in Community Medicine.

Place: Chennai
Date:

Signature of the Candidate

(Dr.E.S.Amarnath)

ABBREVIATIONS

AC	-	Air conduction
ASA	-	American Society of Audiology
ASLHA	-	American Speech Language Hearing Association
ANSI	-	American National Standard Institute
BC	-	Bone Conduction
COHL	-	Conductive Hearing Loss
CPI	-	Consumer Price Index
DALY	-	Disability Adjusted Life Year
DB	-	Decibel
DF	-	Degree of Freedom
DM	-	Diabetes Mellitus
DISH	-	Directorate of Industrial Safety and Health
EAC	-	External Auditory Canal
ESI	-	Employees State Insurance
HL	-	Hearing Loss
HI	-	Hearing Impairment
HPD	-	Hearing Protection Devices
HT	-	Hypertension
HZ	-	Hertz
NIHL	-	Noise Induced Hearing Loss
ONIHL	-	Occupational Noise Induced Hearing Loss
OSH	-	Occupational Safety and Health
SPSS	-	Statistical Package for Social Sciences
SES	-	Socio Economic Status
SPL	-	Sound Pressure Level
TM	-	Tympanic Membrane
WHO	-	World Health Organization

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Introduction

1. INTRODUCTION

1.1. Ear and its importance

Ear is one among the sense organs in the human body which plays a vital role in overall development of an individual. Auditory sense is particularly important to human being as it allows us to communicate with external world. Ears are very important for hearing and body balance. The ear diseases can cause difficulty or hearing impairment which interferes with communication skills and productivity of an individual. The ear diseases can also causes body balance disturbances and that interfere with normal daily activities.

1.2. Ear Anatomy

Receptors for two special sensory modalities, hearing and equilibrium are housed in the ear[1]. The ear is divided into three parts. Comprising of outer ear, middle ear and inner ear. Each of which has got a unique function in the process of hearing and equilibrium. The external ear, the middle ear and the cochlea of inner ear are concerned with hearing. The inner ear semi-circular canals, the utricle and the saccule are concerned with equilibrium. Receptors in the semi-circular canals detect rotational acceleration, receptors in the utricle detect linear acceleration in the horizontal direction and receptors in the saccule detect linear acceleration in the vertical direction[1]. Ears are the organs that process sounds, enabling the brain to interpret what the individual is hearing. The outer and middle ears amplify the sound signal (vibrations) and the inner ear converts this sound signal into an electrical impulse that is transmitted to the brain. This

process also produces a frequency (or pitch) and intensity (or loudness) analysis of the sound signal.

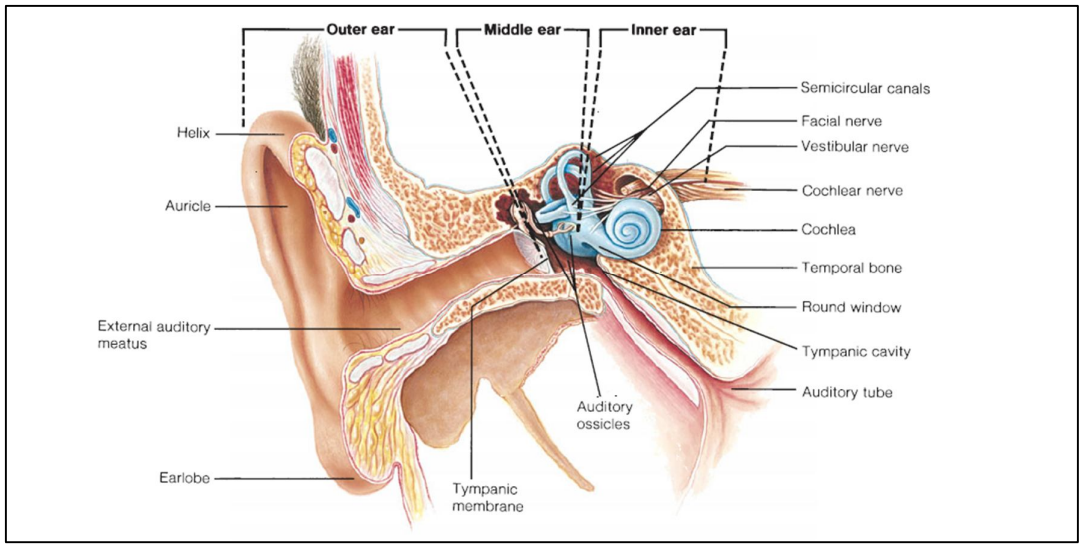

Fig:1.Anatomy of ear: The structures of the outer, middle, and inner portions of the human ear[1].

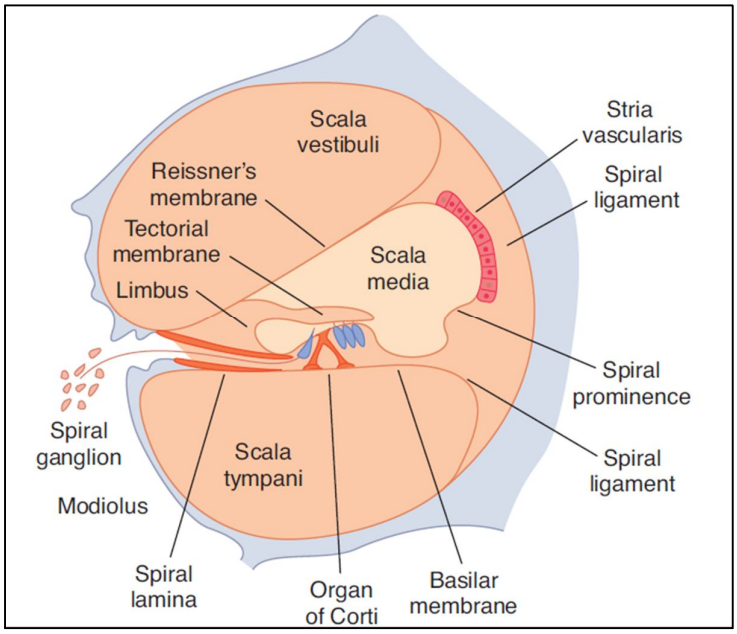

Fig:2.Cross-section of the cochlea, showing the organ of Corti and the three scalae of the cochlea[1] .

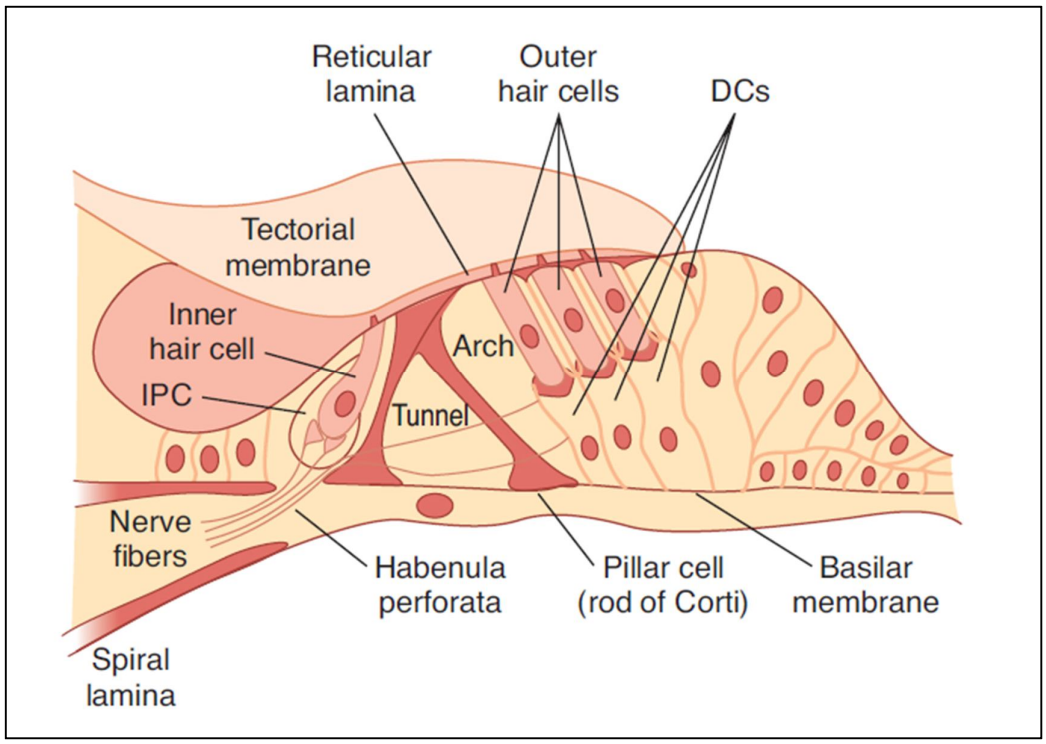

Fig:3.Structure of the organ of Corti, as it appears in the basal turn of the cochlea[1].

1.3. Ear Physiology

Sounds are complex mixtures of pressure variations and travel in invisible waves through air medium and can be heard when they reach a person's or animal's ear[2]. When these sound waves reach the ear, the pinna (ear flap) funnels the sound waves into the ear canal. Sound waves travel down the canal to the eardrum, causing it to vibrate. The vibrations are transmitted through the ossicles (three small bones) which are present in middle ear to the cochlea, causing movement of the fluid and the sensory cells (hair cells) within the cochlea.

The sensory cells present in the cochlea convert the sound vibrations into electrical nerve signals that travel along the auditory nerve to the brain. The brain then interprets these electrical nerve signals as sounds that can be recognized and understood[1].

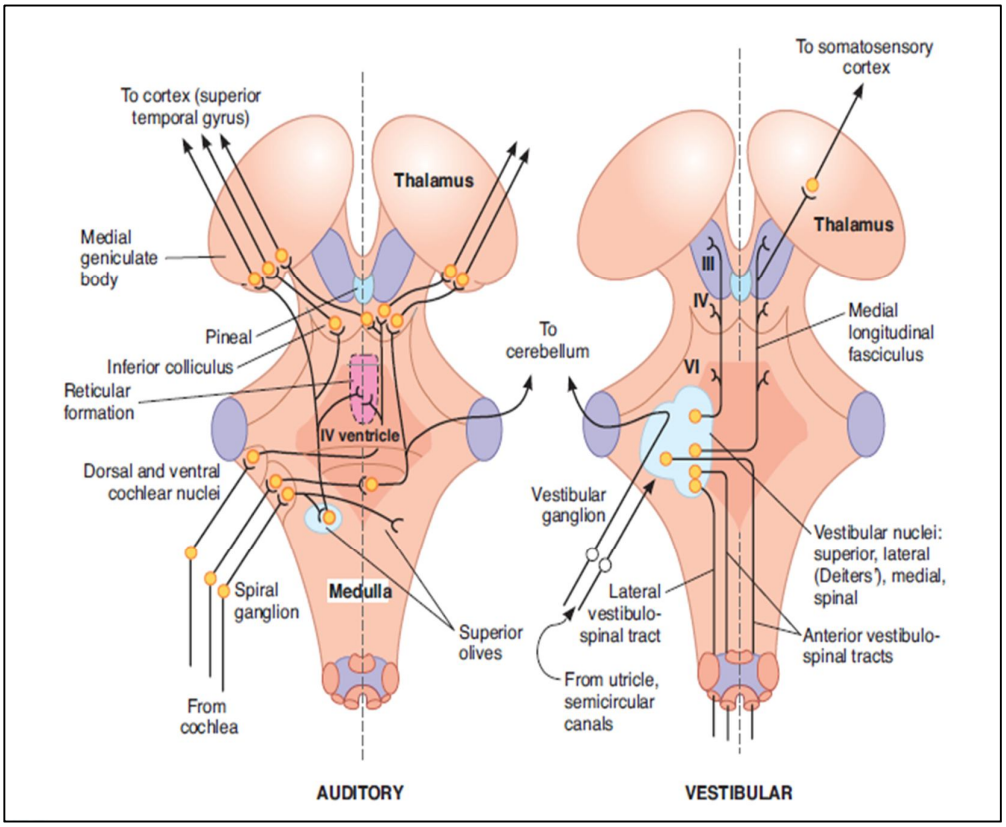

Fig:4.Simplified diagram of main auditory (left) and vestibular (right) pathways superimposed on a dorsal view of the brain stem[1].

There are two types of sensory cells present in the cochlea. They are inner and outer hair cells. The inner hair cells (IHC) generate the electrical signals that are sent to the brain, while the outer hair cells (OHC) act as amplifiers, increasing the stimulus delivered to the inner hair cells[3].

Both types of hair cells possess a bundle of sensory hairs (stereo cilia) which react on sound stimulation by causing membrane depolarisation, neurotransmitter release and finally a generation of action potentials in the described attached cochlear nerves[27] (Henderson, Bielefeld, Harris, & Hu, 2006).

It is important that a fixed number of these cochlea sensory cells are present at birth. In humans and other mammalian species, these sensory cells do not regenerate once they have been damaged[4].

1.4. Sound and Noise

Sound waves travel outward from the source and they travel as transverse and longitudinal waves. Sound cannot travel in vacuum. Sound is perceptible by humans has a range of frequencies from 20 Hz to 20000Hz. Higher frequency sounds recognized in the basal aspect of cochlea. The most important range for human speech reception is between 500 Hz and 3000 Hz[5].

Any unwanted sound is called “Noise “and it is subjective because of the fact that one man’s sound may be another man’s noise [5]. A better definition of noise is “Wrong sound, in the wrong place, at the wrong time” [5].

Man is living in an increasingly noisy environment. Noise is a common occupational hazard in a large number of workplaces such as the iron and steel industry, saw mills, crushing mills, foundries, textile mills, airports and aircraft maintenance shops, automobile industries among many others. In many countries, noise induced hearing loss is one of the most prevalent occupational diseases.

The 20th Century has been described as the "Century of Noise" [6]. Noise has become a very important "stress factor" in the environment of man [6]. The noise is both public health hazard and an environmental pollutant. Sound is measured in units called decibels. Sounds of less than 75 decibels, even after a long exposure, is unlikely to cause hearing loss. However, long or repeated exposure to sounds at or above 85 decibels can cause hearing loss. The louder the sound, the shorter the amount of time it takes for NIHL to happen[23].

Here are the average decibel ratings of some familiar sounds[23]

- Ticking watch- 20 decibels
- Soft whisper- 30 decibels
- The humming of a refrigerator- 45 decibels
- Normal conversation -60 decibels
- Motorcycles- 95 decibels
- Noise from heavy city traffic- 85 decibels
- An MP3 player at maximum volume- 105 decibels
- Siren- 120 decibels
- Firecrackers and guns- 150 decibels

1.5. Noise Induced Hearing Loss (NIHL)

Hearing loss is the most common sensory defect in humans[1]. Excessive exposure to noise both long term, repeated exposure and a single exposure to an extremely intense sound causes damage to the auditory system and results in hearing loss termed noise induced hearing loss (NIHL) [7, 11]. Hearing is important for a successful life. Loss of hearing affects life, employment, education and wellbeing, and is therefore a challenge for an individual routine life. At the work-place hearing loss decreases not only efficiency but also puts a question mark on the individual's safety as well.

The noise induced hearing loss is usually slow in onset but progresses relentlessly for as long as the exposure continues [11]. Indeed, the harmful effects may continue for long time after noise exposure has ceased [12] and are irreversible[7,10].

The damage caused to the cochlea by loud sounds occurs by two means.

1. Mechanical destruction [7, 14, 15].
2. Regular exposure to loud sounds causes the hair cells to lose their rigidity and thus their ability to work effectively.

This change occurs over time until the sensory cells are eventually destroyed and are no longer able to carry out their function [7, 16].

Intense metabolic activity occurs at cellular level [7, 14, 15]. A higher level of energy is required by hair cells during periods of intense exposure to loud sounds. The consequent increased consumption of oxygen generates raised levels of free radicals in the cochlea. The ear's antioxidant defence mechanism is unable to cope up with these levels and the free radicals resulting in cell death.

The physiological changes to the ear are reflected in a change in hearing sensitivity and or the development of tinnitus [14]. Hearing loss can be temporary or permanent [16] and is usually bilateral [20].

Exposure to loud sounds for any length of time causes fatigue of the ear's sensory cells, resulting in temporary hearing loss or tinnitus (a ringing sensation in the ear). This is termed a temporary threshold shift (temporary loss of hearing). For example, a person who attends a loud concert may come out feeling slightly deaf or experiencing tinnitus [7]. Hearing usually recovers within a few hours or a day [20]. Temporary threshold shifts have been reported and measured following attendance at discotheques, rock concerts and sporting events [21].

Nowadays noise is one of the most pervasive problems in occupational environment affecting workers in various professions. Noise is the insidious of all industrial pollutants, involving every industry and causing severe hearing loss in every country in the world. Exposure to excessive noise is the major avoidable cause of permanent hearing impairment.

Noise-induced hearing loss (NIHL) is bilateral and symmetrical, usually affecting the higher frequencies (3000 Hz, 4000 Hz or 6000 Hz) and then spreading to the lower frequencies (500 Hz, 1000 Hz or 2000 Hz). Hair cells in the basal coil of the cochlea are the most sensitive to noise damage.

Occupational noise induced hearing loss refers to a hearing loss caused by loud sounds experienced in work place. Hearing loss is caused by exposure to loud sounds at 85 dB or above over a long period of time [24].

An estimate from National Institute of Health [23] suggests that one third of hearing loss is caused due to noise exposure. Approximately 0.5 million population of Indian metropolitan cities are exposed to hazardous to their hearing.

Hearing handicap is usually denoted as an average hearing threshold level of greater than 25 dB both ears at selected frequencies[25].

Changes to the stereo cilia of the cochlear hair cells lead to diminished hearing sensitivity (based on hearing threshold testing) called a temporary threshold shift (TTS) and permanent . Excessive sound levels produce a hostile acoustic environment by masking wanted signals (e.g. speech or warning signals) and with chronic exposure, by a central blocking-out of all auditory signals. In addition they damage the cochlea and thus produce noise-induced hearing loss. All these have a deleterious effect on education, communication, and the hearing of warning signals [(12)].

Hearing losses from many causes are additive, so that noise-induced hearing loss has become a major cause of handicap in the ageing population, producing handicap sooner than would occur from age alone.

Sound damages the ear first at a frequency of about 4 kHz (the A4 kHz notch) and one of the reasons for this is the acoustic resonance characteristics of the external ear. This hard walled tube, closed at one end, amplifies acoustic energy in the upper frequencies by about 10decibels. In addition, individual variation in the acoustic transfer characteristics of the tube is a factor in the large variability in people's susceptibility to noise.

1.6. Consequences of NIHL [28]

- Social isolation
- Impaired communication with co-workers and family
- Decreased ability to monitor the work environment (warning signals, equipment sounds)
- Increased injuries from impaired communication and isolation
- Anxiety, irritability, decreased self-esteem
- Lost productivity
- Expenses for workers compensation and hearing aids.

Objectives

2. OBJECTIVES

1. To assess the prevalence of hearing loss in the automobile industrial workers.
2. To determine the factors influencing the hearing loss among automobile industrial workers.

Justification

3. JUSTIFICATION

1. Hearing is important for a successful life. Loss of hearing affects life as well as employment, education and wellbeing and is therefore a challenge for an individual during their regular as well as social life.

2. The industrial revolution has modernized the companies with machines replacing man. The technological development created bigger and noisier machines each time, which contributed substantially to aggravate the problem of noise. In recent times it is one of the most important problems in the occupational environment which affects workers in various professions.

3. Industries like textiles, automobile, sawmills, printing and mining etc. are responsible for excessive noise and exposure of workers to hazardous noise levels.

4. In automobile industry loud noise is generated during press operation on the shop floor. For these type industrial facilities having high noise levels, appropriate noise controls must be implemented to prevent workers' daily noise exposures from exceeding a permissible limit.

5. The workers in these industries are exposed to higher noise levels prevailing at the workplace. In industries the workers are subjected to a risk of loud noise for prolonged duration. This could affect not only their hearing acuity

but also may reduce social interaction, social responsibility, diminish helping behavior and increase aggressive response.

6. There are therefore several reasons to assess the burden of disease from occupational noise at country or subnational levels. Occupational noise is a widespread risk factor with a strong evidence base linking it to an important health outcome (hearing loss).

7. NIHL is therefore the responsibility of employers as well as individuals.An assessment of the burden of occupational noise induced hearing loss can help guide policy and focus research on this problem.

8. Chennai is nicknamed as Detroit of Asia[36]. Chennai is the home for global and Indian auto majors. The Indian auto component industry is moving towards grabbing the global auto component outsourcing market.

9. The 4-Wheeler vehicles in Chennai are the base of 30% of India's automobile industry[37] and 35% of its automobile component industry[38, 39]. There is abundant availability of skilled manpower in automobile engineering making Tamil Nadu the most effective location.

10. So many automobile industries have come up in the last couple of decades on the outskirts of Chennai. These industries are producing heavy noise at the work place. This noise gives an impact on workers' health. Hence this work has been taken up to study the prevalence of hearing loss among automobile industrial workers.

11. After exhaustive review literature very few published studies are available on the automobile industrial workers in India and Tamil Nadu.

12. The outcome of the present study will raise the level of awareness among industrialists and workers on health risks of their workplace environment.

Review of Literature

4. REVIEW OF LITERATURE

Loss of hearing is an important cause of disease's burden[40].Globally 360 million persons are suffering from disabling hearing loss; in South Asia 27%, East Asia 22%, Asia Pacific10%, Central Asia 9%, high income group 11%, Latin America and Caribbean 9%, Central/East Europe 3%, Middle East 3%,Sub Saharan Africa 9% and North Africa 3%[41].

Hearing loss is a major occupational health problem among industrial workers. Excessive noise is a global occupational health hazard with considerable social and physiological impacts, including noise-induced hearing loss (NIHL)[42].

According to National Institute for Occupational Safety and Health (NIOSH), the proportion of the population exposed to occupational noise was estimated using noise exposure data on the distribution of the work force by occupational category and economic sector, and economic activity rates in each WHO sub regions.

These values for the exposed population and risk measures for NIHL were used to develop estimates of the attributable fraction (AF) of adult-onset hearing loss resulting from occupational noise exposure. The AFs were applied to WHO

estimates of total disability adjusted life years (DALYs) from adult-onset hearing loss to estimate the DALYs due to occupational noise[43].

Disabling hearing loss refers to hearing loss greater than 40 dB in the better hearing ear in adults (15 years or older) and greater than 30 dB in the better hearing ear in children (0 to 14 years) [41].

Worldwide, 16% of the disabling hearing loss in adults (over 4 million DALYs) is attributed to occupational noise, ranging from 7% to 21% in the various sub regions. The effects of the exposure to the occupational noise are larger for males than females in all sub regions and higher in the developing regions. Only a few reports from India give statistical data regarding the incidence and aetiology of hearing impairment. These are generally on a state or district rather than national basis[43].

An Indian Council of Medical Research (ICMR) report in 1983 found the proportion of hearing impairment to be 10.7%. A study by Kacker (1989) found hearing impairment to range from 13.5% to 18.5%. Sensorineural loss was more common in the urban population, whereas conductive loss was more common in the rural population[43].

A 10 year study of noise-induced hearing loss in coalfield, steel plant, textile and pharmaceutical industry workers and natural oil and gas plants found

that the amount of noise trauma depended on intensity and also on characteristics of noise, duration of exposure, physically, there is no difference between sound and noise.

Sound is a sensory perception and noise corresponds to undesired sound. By extension, noise is any unwarranted disturbance within a useful frequency band (NIOSH, 1991)[43].

Noise is present in every human activity, and when assessing its impact on human well-being it is usually classified either as an occupational noise (i.e. noise in the workplace), or as environmental noise, which includes noise in all other settings, whether at the community, residential or domestic level (e.g. traffic, playgrounds, sports, music).

The situation is improving in developed countries, as more widespread appreciation of the hazard has led to the introduction of protective measures. Data for developing countries are scarce, but available evidence suggests that average noise levels are well above the occupational level recommended in many developed nations (Suter, 2000; WHO/FIOH, 2001). The average noise levels most of the developing countries may be increasing because industrialization is not always accompanied by protection.

The Global Burden of Disease study estimated exposure distributions using an occupational category approach, modified to reflect the different noise exposures for occupations in different economic subsectors. This approach can be applied at the national level, using country data were available, or by extrapolating from data for other studies if local data are not available.

The first step is to assess the proportion of workers in each occupational category that is exposed to at least moderately high occupational noise levels (>85 dB(A)).

Impact of hearing loss[44]

Functional impact

One of the main impacts of hearing loss is on the individual's ability to communicate with others. Hearing loss and ear diseases can have a significantly adverse effect on the academic performance of an individual. However, when opportunities are provided for people with hearing loss to communicate they can participate on an equal basis with others. The communication may be through spoken/ written language or through sign language.

Social and emotional impact

Limited access to services and exclusion from communication can have a significant impact on everyday life, causing feelings of loneliness, isolation and frustration, particularly among older people with hearing loss.

Economic impact

Adults with hearing loss have a much higher unemployment rate. Among those who are employed, a higher percentage of people with hearing loss are in the lower grades of employment compared with the general workforce. In addition to the economic impact of hearing loss at an individual level, hearing loss substantially affects social and economic development in communities and countries.

A cross sectional study conducted by **Asad Jamal et al** in 2016 on the Noise Induced Hearing Loss and Its Determinants in Workers of an Automobile Manufacturing Unit in Karachi, Pakistan. In their study the noise induced hearing loss among automobile manufacturing workers was 25%[45].

A study cross sectional study conducted on the noise induced hearing loss in industrial workers of Chennai in 2008 by **Deepalakhsmi et al** they found NIHL prevalence 18% in automobile industrial workers[46].

A cross sectional industrial study was conducted by **Naroita Tahir et al** in the year 2012-2013 interviewing OSH practitioners at 26 industries categorized as food, tobacco, textile, wearing apparel, wood products except furniture, paper, refined petroleum, chemicals, non-metallic mineral, basic metal, fabricated metal and motor vehicle parts. Prevalence of NIHL found to be 8%[47].

A comparative cross-sectional study conducted by **Emmanual D Kitcher et al** in Ghana of 140 workers from the stone crushing industry compared with a control group of 150 health workers in the year 2012. They found that there was a prevalence of subjective hearing loss occurred in 21.5% of the workers and in 2.8% of the controls[48].

A combined case control and cross sectional study conducted in Coimbatore, Tamil Nadu by **S H Harshita et al** on noise induced hearing loss in spinning mill workers found to have prevalence of 81%[49.]

A combined cross sectional study cross sectional study conducted by **Shanthimalar et al** in Chennai on the effect of noise exposure on hearing in the professional drivers and office workers found with prevalence rate of NIHL of 64%[50.]

A study conducted by **GK Amedofu** among Workers in a Surface Gold Mining Company in Ghana in 2002 found that 23% prevalence of NIHL[51].

The National institute of miners' health (NIMH) has carried out NIHL studies in various mines of India. NIHL was prevalent among 12.8% of the employees. Moderate NIHL was detected in 10.2% and severe NIHL was observed in 2.6% of the employees[52.]

A study conducted by dube k j et al found that 96% prevalence of hearing loss in a ginning factory of Maharashtra[53].

A case control study conducted by **Sri Harmadji et al** in a steel factory in Indonesia found that prevalence of 84% prevalence of noise induced hearing loss[54].

A cross sectional study conducted in Brazil on the workers of metullergical company by **Guerra MR et al** revealed the prevalence of cases suggestive of NIHL was 15.9%[55.]

In most places in India the international standard for safety from noise exposure is recognised and noise-induced hearing loss has also been incorporated into the Indian Factories Act (1996 amendment) as a notifiable and compensable disease.

NATIONAL PROGRAM FOR PREVENTION AND CONTROL OF DEAFNESS (NPPCD)

This programme was launched on a pilot basis in the year 2006-2007(January 2007).For the practical purposes this programme is decentralized and implementation of the programme is being done through the State and District health societies.

OBJECTIVES OF THE PROGRAMME:

- To prevent avoidable hearing loss on account of disease or injury.
- Early identification, diagnosis and treatment of ear problems responsible for hearing loss and deafness.
- To medically rehabilitate persons of all age groups, suffering with deafness.
- To strengthen the existing inter-sectoral linkages for continuity of the rehabilitation programme for the persons with deafness.
- To develop institutional capacity for ear care services by providing support for equipment, material and training personnel.

Long term objective: To prevent and control the major causes of hearing impairment and deafness, so as to reduce the total disease burden by 25% of the existing burden by the end of 12th Five Year Plan.

INTERNATIONAL DAY FOR EAR AND HEARING

International day for Ear and hearing was celebrated by WHO on 3rd March 2012 to create awareness and promotes community based activities for ear and hearing care.

INTERNATIONL NOISE AWARENESS DAY

Last Wednesday of April every year has been declared “International Noise Awareness Day” (INAD).

Methodology

5. METHODOLOGY

5.1. Study Design:

The study was an industry based cross sectional study conducted among the automobile industrial workers of Kanchipuram District, Tamil Nadu.

5.2. Study Place:

The study was conducted in the automobile industrial workers of Kanchipuram District.

5.3. Study Population:

The study was conducted among the workers of Automobile Industries of Kanchipuram District.

5.4. Study Duration:

The study was done from March 2017 to August 2017

5.5. Sample Size:

The sample size is calculated based on the study [27].Based on previous study noise induced hearing loss is (p=25%).

Confidence level of 95%, Relative precision of 15% and 10% excess sampling to account for non-response.

Sample size (N) is calculated using the formula: $N= \frac{Z^2\, pq}{L^2}$

Where

Z (Relative coefficient) at 95% confidence level=1.96

p is the prevalence (p=25%)

q = (100-p), i.e. q=75%

L is the relative precision=20%

$= \frac{1.96^2 x\ 25x75}{5^2} = \frac{7203}{25} = 288$

Allowing a 10% non-response rate the sample size is 316.

5.6. Sampling Method:

Multi stage sampling method.

SAMPLING FRAME

The current study was carried out in two industries located at Kanchipuram district, Sriperumbudhur area to assess the prevalence of hearing loss among automobile industrial workers and to determine the risk factors associated with hearing loss using Pure Tone Average based on the audiogram.

In first stage, based on the details obtained from the Director of Industrial Safety and Health database, in Kanchipuram district totally 7 taluks were shortlisted and based on sample size requirement for our study, Sriperumbudhur taluk was selected randomly.

Total Number of Large scale Automobile Factories in Kancheepuram district shortlisted by Director of Industrial Safety and Health database:

First stage: Taluk was selected randomly

S.No	Taluk NAME	Total Number of Automobile Industries
1.	Chengalpattu	3
2.	**Sriperumbudur**	5
3.	Kancheepuram	2
	Total	10

Second stage:

In second stage, from the Sriperumbudhur taluk, there were totally 5 large scale automobile industries, **two large scale automobile industries were selected randomly**. Among the two automobile industries, consent was obtained and 316 study participants were enrolled for the current study

5.7. Inclusion Criteria

Workers in automobile industries of Kancheepuram district willing to participate in the study.

5.8. Exclusion Criteria

1. Those automobile industrial workers who are not willing to participate.
2. Those subjects having congenital ear abnormality and impacted wax in their ear canal on examination.

5.9. Operational Definition

Normal hearing

Air conduction threshold of 20 dB or less at all test frequencies.

Hearing loss:

Hearing loss also known as hearing impairment is a partial or total inability to hear. Air conduction threshold of 25 dB or more at any of the test frequencies.

Sensori neural hearing loss:

It is type of hearing loss in which the root cause lies in the inner ear or sensory organ (cochlea and associated structures) or the vestibule cochlear nerve (cranial nerve VIII) or neural part.

Conductive hearing loss:

It is a problem conducting sound waves anywhere along the route through the outer ear, tympanic membrane or middle ear.

Mixed hearing loss:

It is a combination of conductive and sensori neural hearing loss.

Hearing impairment

Arithmetic average of air conduction thresholds at 500, 1000, 2000 and 3000 Hz of 25 dB or more.

Occupation category:

Unskilled: According To Minimum Wages Act, Unskilled worker is one who does involves simple duties that does not require learning of any special skill or previous experience although familiarity with the work place environment is needed.

Semi-skilled: According To Minimum Wages Act, Semiskilled worker is one whose work is limited to the performance of duties of routine nature and of limited scope. His work does not require so much of judgement and skill.

Skilled: According To Minimum Wages Act, Skilled worker is one who requires extensive knowledge of the trade, craft or industry in which he is employed. His work involves independent judgement and responsibility.

5.10. Study Tool:

The study tool was a semi-structured interview based questionnaire administered by the investigator.

Questionnaire: The questionnaire has got 3 sections which included the following.

Section I: The information on socio-demographic profile and work characteristic of automobile industrial workers.

This section included name, age, gender, literacy, type of work, address, nature of work, duration of work , shift work, pre placement audiogram, annual hearing check-up and monthly income.

Section II: The information on the medical history.

This section included medical history of the automobile industrial workers regarding the history of high blood pressure, details ear morbidity and the usage hearing protection devices (HPD).

Section III: Clinical Examination of the individual.

1. Blood pressure measurement:

Using mercury sphygmomanometer, blood pressure was measured in sitting posture, right upper arm in mm of Hg. Three readings were taken at the interval of 2 to 3 minutes. Average of the three readings was taken as the blood pressure.

2. Ear examination:

Before examination of ear, the procedure was explained to the subject and also instructed the subject to report immediately for any discomfort or pain experienced during the ear examination. The subject advised to be seated comfortably and should remain motionless during examination.

With the help of auto powered illuminated headlight the outer ear on both sides examined for any abnormality followed by internal anatomy was examined by auto powered illuminated otoscope and the status of the external auditory canal (EAC) and tympanic membrane (TM) identified. It was ensured that all the subjects were in good health and no history of severe otological symptoms reported at the time of testing.

3. Pure tone audiometry

It was done to all the 316 subjects by calibrated GRAPHIC DIGI RS-1 AUDIOMETER with headphones and bone vibrator.

5.11. Data collection method:

Data collected for the study collected by the following methods.

1. Ethical approval for the study was obtained from the Institutional Ethics Committee of Madras Medical College.

2. Field data collection was done after obtaining official permission from the Director, Institute of Community Medicine, Dean of Madras Medical College, Director of Industrial Safety and Health and the management of automobile industries.

3. Information about the workers was obtained from the management of automobile industry.

4. Only those subjects were willing to participate alone taken for study after explaining about the purpose of investigation and expected outcomes. All subjects singed the questionnaire as their written consent.

5. Ear examination done by the investigator with head light and otoscope. Anatomy of the ear examined.

6. Then the workers were subjected to pure tone audiogram test

Fig: 5.Ear examination with otoscope

Fig: 6.Head light

Fig: 7.Otoscope

5.12. Pure tone audiometry

Pure tone audiometry is the science of ascertaining the hearing acuity of a subject pure tone sound of various frequencies.

Pure tone audiometry is a quantitative hearing test done to assess the nature and degree of hearing loss to properly plan most appropriate interventions. Pure tone audiometry is a useful measure of basic hearing function.

Pure tone air conduction and bone conduction tests determine hearing level, type of hearing loss, the frequencies that are affected (configuration) and hearing loss is unilateral or bilateral. Pure tone audiometry indicates what hearing thresholds (dB) are required to just be able to perceive a tone at different frequencies (Hz). The decibel scale used in pure tone audiometry is dB Hearing Level (dB HL). The dB HL intensity scale is based on normal human hearing with 0 dB HL representing the median threshold for otologically normal young adults.

Pure tone testing is the measurement of an individual's hearing sensitivity to calibrate pure tones at different frequencies. The basic audiological assessment focuses on pure tone air conduction thresholds in the frequency range 0.25 - 8 KHz. using variable sound pressure level intensities.

Pure tone audiometric done to subjects by a qualified audiometrician using a calibrated pure tone audiometer. They are used to measure hearing thresholds.

Test Environment: The test was conducted in a sound isolated environment in the administrative block of the automobile industry by a qualified audiometrician.

Test Procedure: Each ear is tested separately using various transducers such as headphones and bone conductors. As it is a behavioural test, it is dependent on the response from the individual being tested. The hearing test lasted 10-15 minutes for each participant performed during work shift period of 8 hours duration. Air conduction thresholds are the first measurements obtained

during pure tone audiometry. With the use of headphones or insert earphones, the audiologist will play multiple sounds at each frequency and determine the lowest sound pressure level (dB) at which ≥50% of the tones are perceived.

The examiner first familiarizes the subject with the tone by introducing the sound at an arbitrary presumed suprathreshold level. If the subject here the tone then the tone is reduced in steps of 10 dB till the subject stops hearing or fails to give a response. Once this stage is reached the tone is raised by 5Db.if the subject hears this tone the sound is again increased to 10 Db. If he does not hear it, the tone is again raised by 5 Db. In this way several threshold crossings, the exact hearing threshold obtained when one gets at least 3 out of 5 responses correct. This method of obtaining threshold is called 5-up-10-down method[31].

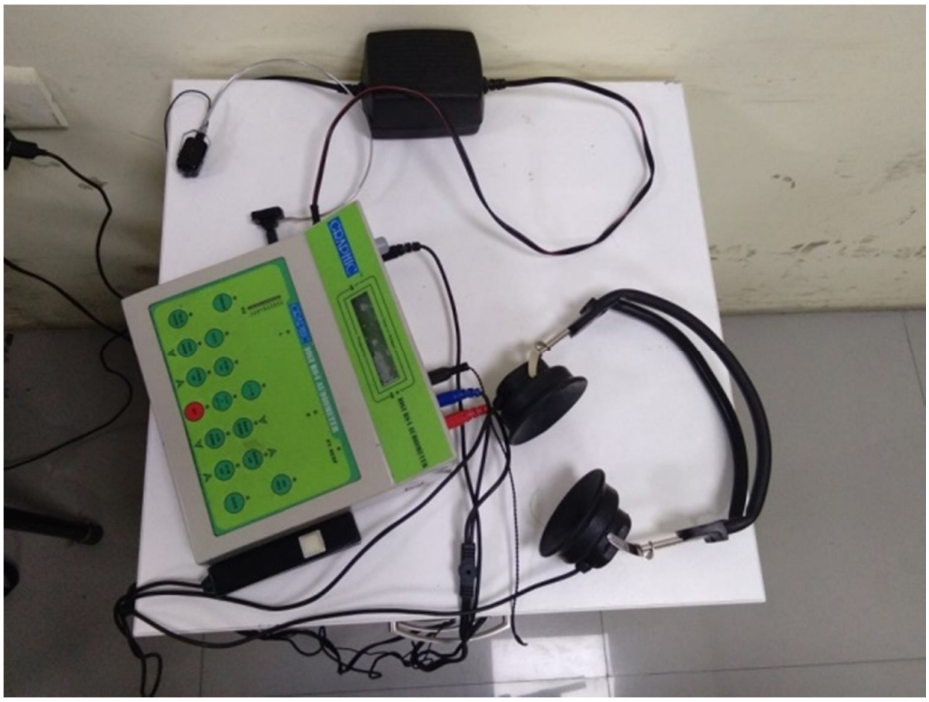

Fig: 8.Pure tone Audiometer

Fig: 9.Placement of ear microphone over ears

Fig.10.Placement of bone conductor on the mastoid

Fig.11.Transducer

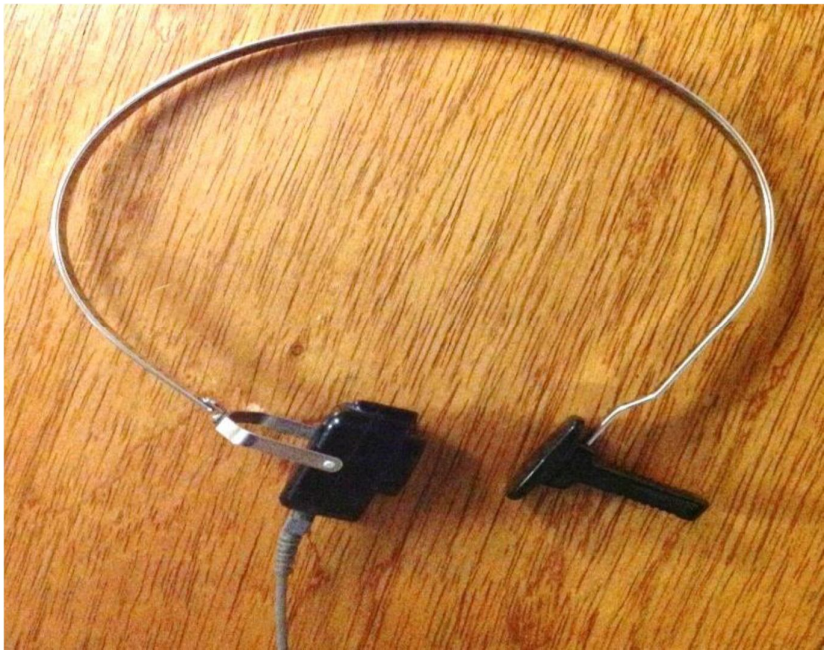

Fig.12.Bone Conductor Vibrator

Audiogram: Pure tone thresholds at each frequency are plotted on a graph called an audiogram which depicts the type, degree and configuration of the hearing loss of each ear. These thresholds are recorded on an audiogram grid. A standard audiogram grid has the **sound pressure level along the Y axis**, with increasing intensity from top to bottom and **frequency along the X axis**. Frequency is ordered with low pitched tones on the left and higher pitched tones on the right. The patient's thresholds are mapped using coded symbols with X representing the left ear, and O representing the right. **Continuous line** represents the air conduction thresholds. **Dotted line** represents the bone conduction thresholds. The pure tone thresholds marked in **red colour** to right ear and **blue colour** in left ear.

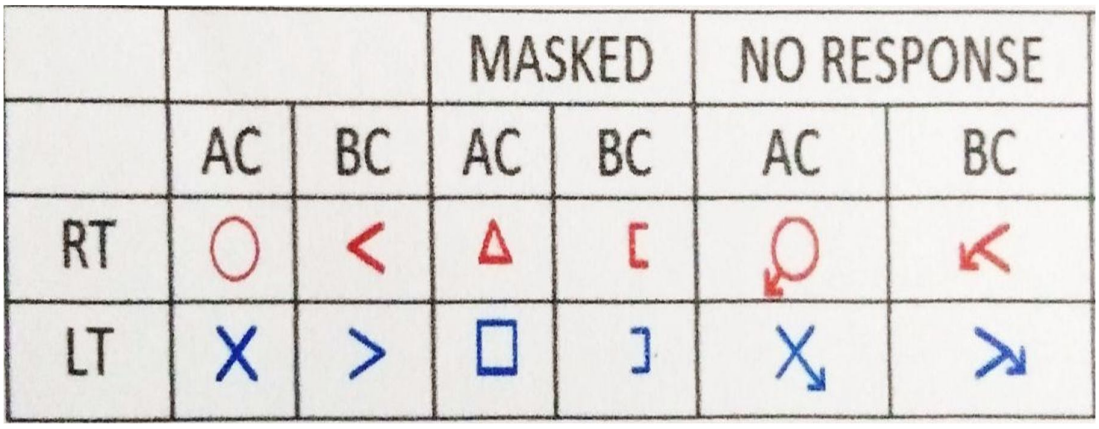

Fig:13.Legend of symbols used on a standard audiogram. Example of pure tone audiogram and symbols recommended by the American Speech-Language-Hearing Association (ASLHA)

5.13.Interpretation of Audiogram:

Graphically, the first step in interpreting an audiogram is to assess for hearing loss using the air conduction thresholds. If a patient's thresholds fall below 25 dB, then some degree of hearing loss is present. Graphically, the horizontal line at "0" on the Y axis is denoted as Audiometric Zero, or the calculated average of the lowest sound pressure heard in thousands of non-pathologic ears. Thus, a patient's threshold hearing ranges are calculated to be relative to the audiometric zero, not to true sound pressure levels.

Pure tone average: A patient's Pure Tone Average can be calculated by taking the average of the speech frequencies at **500, 1000, and 2000 Hz** as the normal human speech comprises mainly the sounds of above these frequencies[31].

Types of hearing loss: From the audiogram we can interpret whether the deafness is conductive, sensori-neural or mixed. The amount of hearing loss by air conduction and bone conduction is seen and the **air-bone gap** is calculated.

If the bone conduction is normal (within say 15-20 dB HL) but the air-bone gap is 20dB or more then the deafness is **conductive type**[31].

If the bone conduction is more than 20dB and if the air-bone gap is 15 dB or lesser then the deafness is **sensori-neural**[31].

If the conduction level is worse (more) than 20 dB and the air-bone gap is 20 dB or more then the deafness is **mixed**[31].

Table: 1.Degree of hearing loss:

Degree of hearing loss	Hearing loss range (dB HL)
Normal	Upto 25
Mild	26 to 40
Moderate	41 to 55
Moderately severe	56 to 70
Severe	71 to 90
Profound	91+

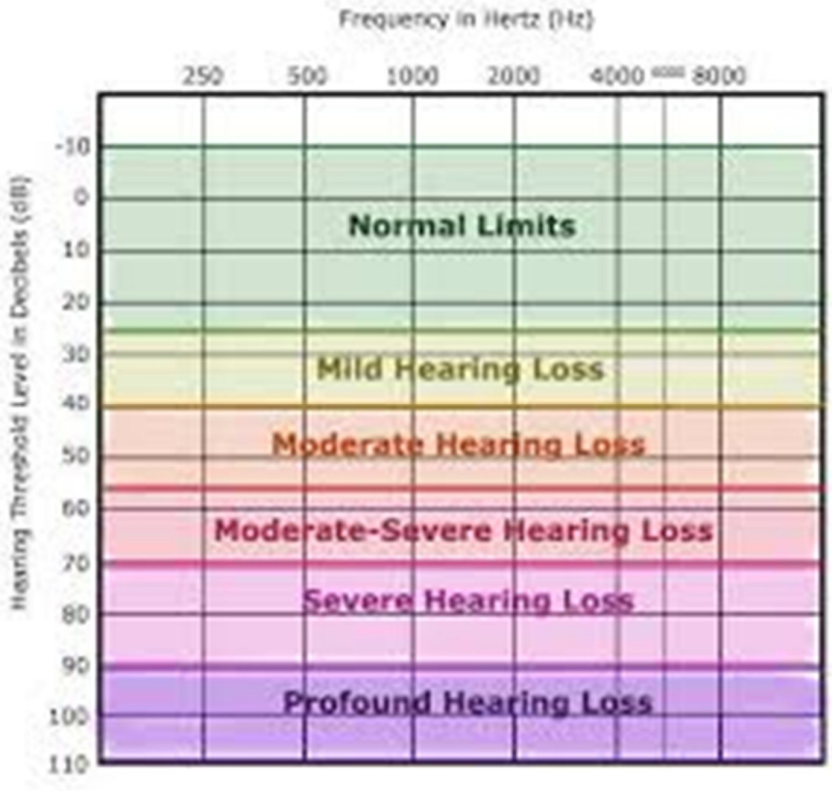

Fig:14.Degree of hearing loss and audiometric grid.

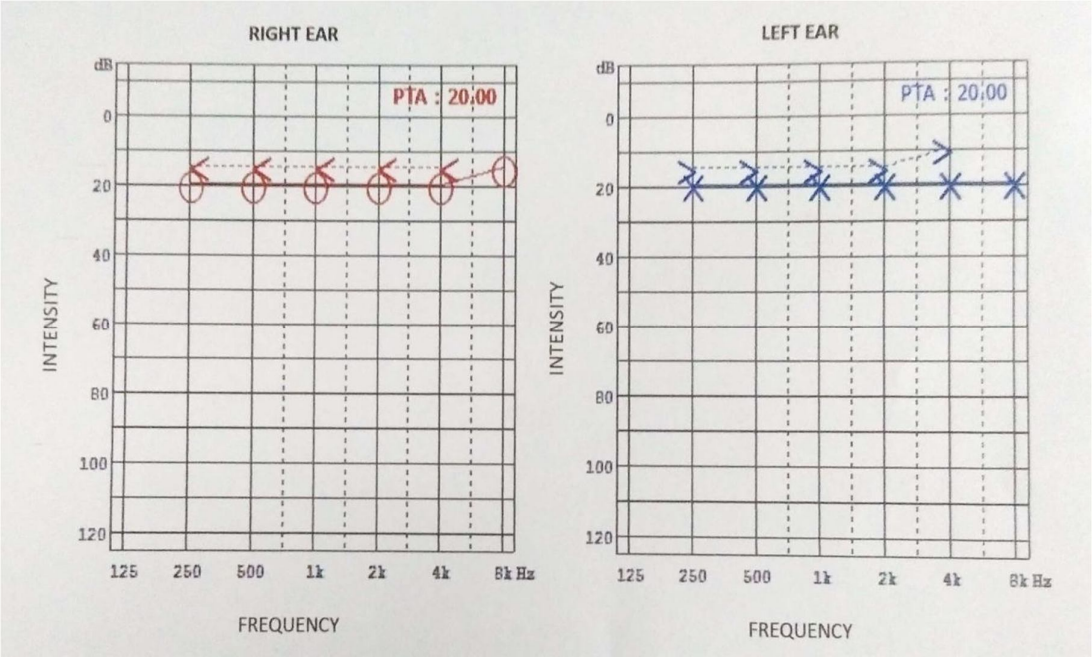

Fig: 15.Normal hearing in both ears

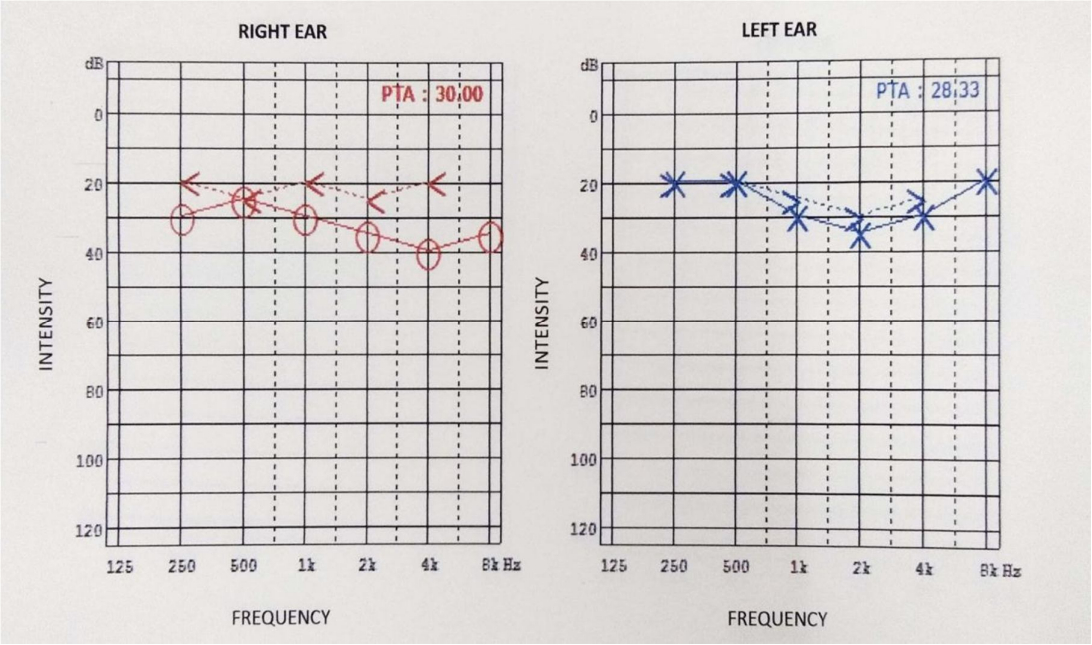

Fig.16.Bilateral mild sensori-neural hearing loss

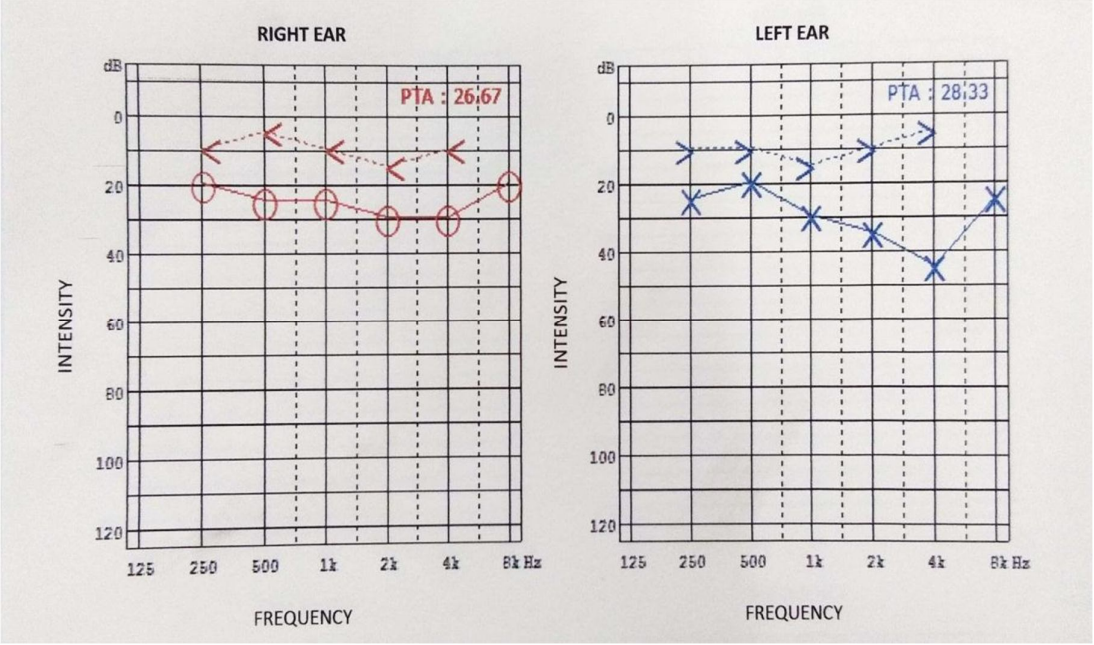

Fig.17.Bilateral mild conductive hearing loss

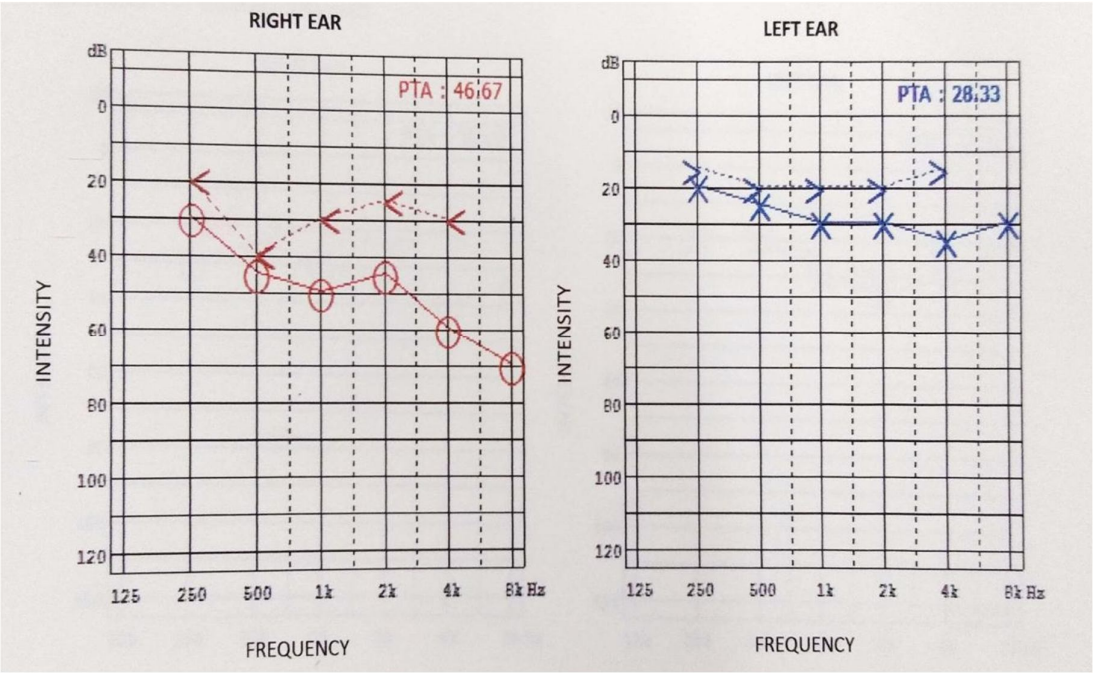

Fig.18.Moderate mixed hearing loss- right ear

Mild sensori-neural hearing loss- left ear

Below mentioned protocol for diagnosis of Noise Induced Hearing Loss was followed.

1. History of prolonged exposure to loud noise**.**
2. Abnormalities in air and bone conduction bilaterally.
3. Audiograms showing characteristic dip at 4 KHz.

Table: 2.Notch criteria from Coles et al. (2000) and Niskar et al. (2001). Source: Rabinowitz et al. (2006)[23].

Criteria	Application of metrics	Notch criteria
Coles, Lutman, & Buffin (2000)	Published criteria for identification of an audiometric notch for use in medico-legal diagnosis of NIHL.	A high-frequency notch with the hearing threshold at 3, 4 and/or 6 kHz **at least 10 dB** greater than at 1 or 2 kHz and **at least 10 dB** greater than at 6 or 8 kHz
Niskar, Kieszak, Holmes, Esteban, Rubin, & Brody (2001)	For use in identifying NIHL in the audiograms of adolescents tested in the National Health and Nutrition Evaluation Survey.	Hearing-threshold level values at 0.5 and 1 kHz ≤15 dB; Worst (i.e., greatest value) threshold at 3, 4 or 6 kHz at least 15 dB worse than the worst threshold value at either 0.5 or 1 kHz A hearing threshold at 8 kHz at least 10 dB better than the worst threshold at 3, 4 or 6 kHz

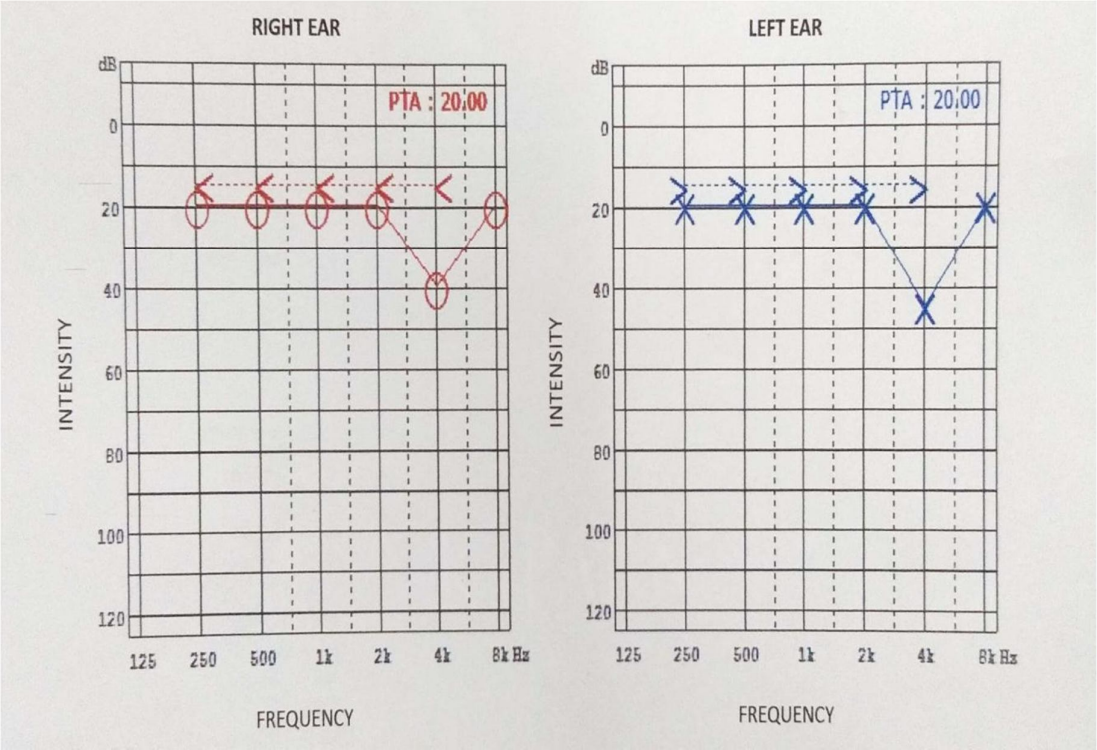

Fig:19.Normal hearing both ears with 4 KHz dips

5.14. Services rendered:

Pure tone audiometric tests were done to all the study participants. After the screening of all the study participants in both the industries, health education and awareness given on importance of hearing and prevention of noise induced hearing loss. Those study participants with the ear diseases found on examination advised medications and further follow up to be done at the nearby government hospital for specialist treatment.

Data Entry & Analysis

6. DATA ENTRY AND ANALYSIS

6.1. Data Entry:

Data were collected from 316 automobile industrial workers. The data collected from the questionnaires were entered in Microsoft Excel 2010 version and the master chart was framed. The data entered were double checked for any errors.

6.2. Data Analysis

The data from the master chart the data were exported to Statistical Package for Software Solutions (SPSS) version 16 and was analysed.

Continuous variables like age, blood pressure and categorical variables like gender, socioeconomic status, work experience, usage of hearing protective device, family history of hard of hearing, intake of ototoxic drugs were presented in the form of descriptive statistics and frequency distributions respectively. Other factors like non auditory effects, clinical examination and ear examination were also presented in the form of descriptive statistics and frequency distributions respectively and charts were depicted.

The association between the independent variables and outcome variables i.e., hearing loss were tested for significance using chi square test. P value <0.05 was considered as statistically significant.

Results

7. RESULTS

The study was an industry based cross sectional study to assess the prevalence of hearing loss among automobile industrial workers with a study population of 316.

Table.3. Industry wise study participants

S. No.	Industry	Number of participants	Percentage
1.	Industry 1	138	43.67%
2.	Industry 2	178	56.33%

The total numbers of study participants in two industries were 316 with 138 and 178 participants respectively.

Table.4. Age distribution of study population

S. No.	Age Group	Frequency	Percentage
1.	18-28	192	60.8%
2.	29-38	101	32%
3.	39-48	21	6.6%
4.	49-58	2	0.6%

Our study group had a minimum age of 18 years to maximum age of 56 years. Mean age was 28.05 years with a standard deviation of 6.98 years

Table.5. Sex distribution of study population

S. No.	Sex	Number of participants	Percentage
1.	Male	311	98.4%
2.	Female	5	1.6%

The total numbers of study participants were 316. Out of which there are 311(98.45%) were male and 5(1.6 %) were female.

Table.6. Educational status of study population

S. No.	Education	Frequency	Percentage
1.	Illiterate	9	2.8%
2.	Primary	5	1.6%
3.	Middle school	52	16.5%
4.	High school	54	17.1%
5.	Higher secondary / Diploma / ITI	105	33.2%
6.	Undergraduate/ Postgraduate	91	28.8%

The Table shows the educational status of study population with maximum participants in the category of Higher secondary/ Diploma/ ITI about 33.2% and Undergraduate/ Postgraduate about 28.8% and Illiterate about 2.8%

Table: 7.Types of work of study population

S.No.	Types of Staff	Numbers	Percentage
1.	Administrative/clerical/executives/non field staff	57	18
2.	Field/skilled staff:	259	82

The study participants were categorised into two group

- Administrative/clerical/executives/non field staff about 18%. In this group, it includes the following category of staff
    1. Administrative staff
    2. Ambulance driver
    3. Driver
    4. Plant human resource manager
    5. Production department
    6. Purchase department
    7. Security personnel

- Field/skilled staff is about 82% and this group include the following categories of staff

    1. Assembling
    2. Weld shop
    3. Assistant manager welding
    4. Plant manager
    5. Fork lift driver
    6. Fork lift operator
    7. Plant assistant manager
    8. Plant engineer
    9. Plant store
    10. Press shop
    11. Safety officer
    12. Tear down

Table:8. Work related factors and environmental factors of study population

S. No.	Variables	Category	Numbers	Percent
1	Type of work	Skilled	259	82%
		Clerical/ administrative/ executive/ non field staff	57	18%
2	Work experience	Less than 2 years	190	60.1%
		More than 2 years	126	39.9%
3	Pre placement audiogram	Yes	15	4.7%
		No	301	95.3%
4	Periodical audiogram	Yes	25	7.9%
		No	291	92.1%
5	Noise exposure previous working station	Yes	26	8.2%
		No	290	91.8%
6	History of systemic Hypertension	Yes	5	1.6%
		No	311	98.4%
7	Family history of Hard of Hearing	Yes	0	0%
		No	316	100%
8	Ototoxic drugs like streptomycin , quinine	Yes	0	0%
		No	316	100%

About 82% were skilled workers. Majority of them (60.1%) had work experience less than 2 years. Pre placement audiogram was done only for 4.7%. Periodical audiogram is done for 7.9% of participants. 26 participants (8.2%) had history of noise exposure in previous working station. 5 participants had a family history of systemic hypertension. No participants had a family history of hard of hearing. No participants had a history of ototoxic drug intake.

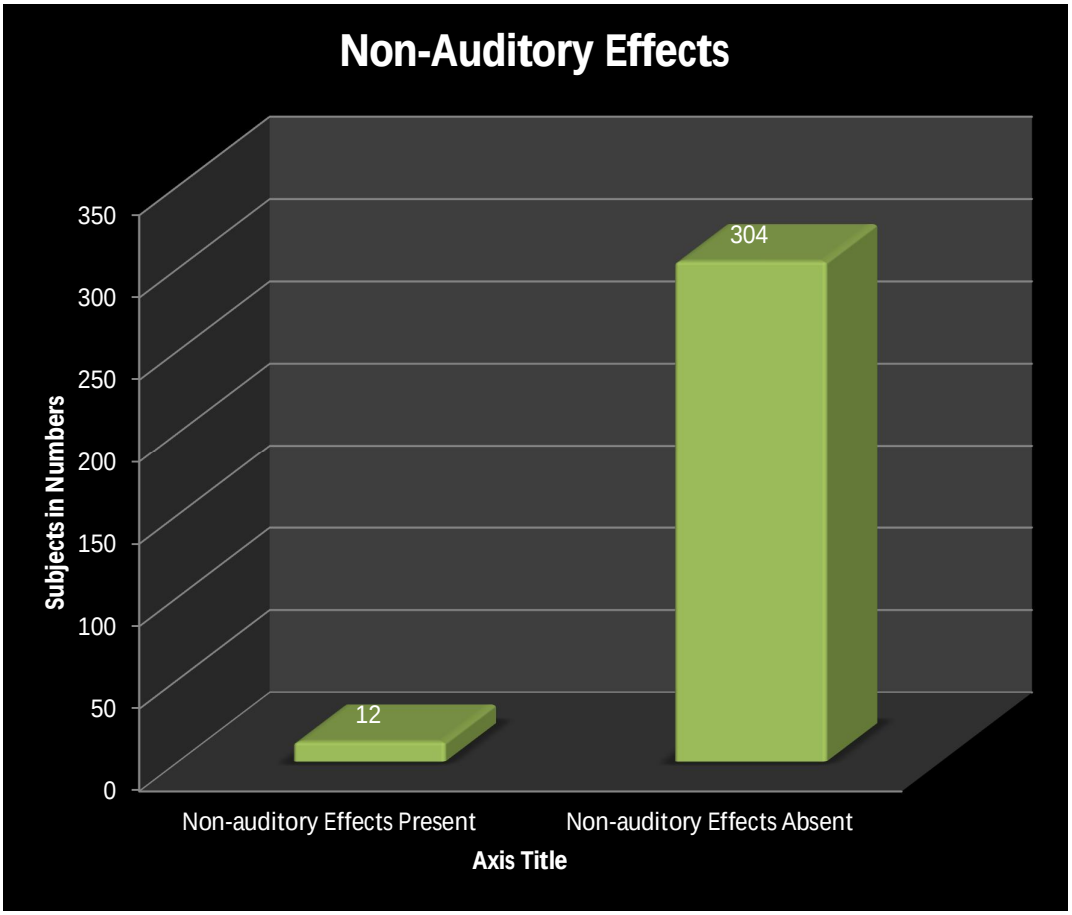

Fig: 20.Non-Auditory Effects

The above figure shows that among the participants, only 12 had non auditory effects present. Remaining 304 had no non auditory effects.

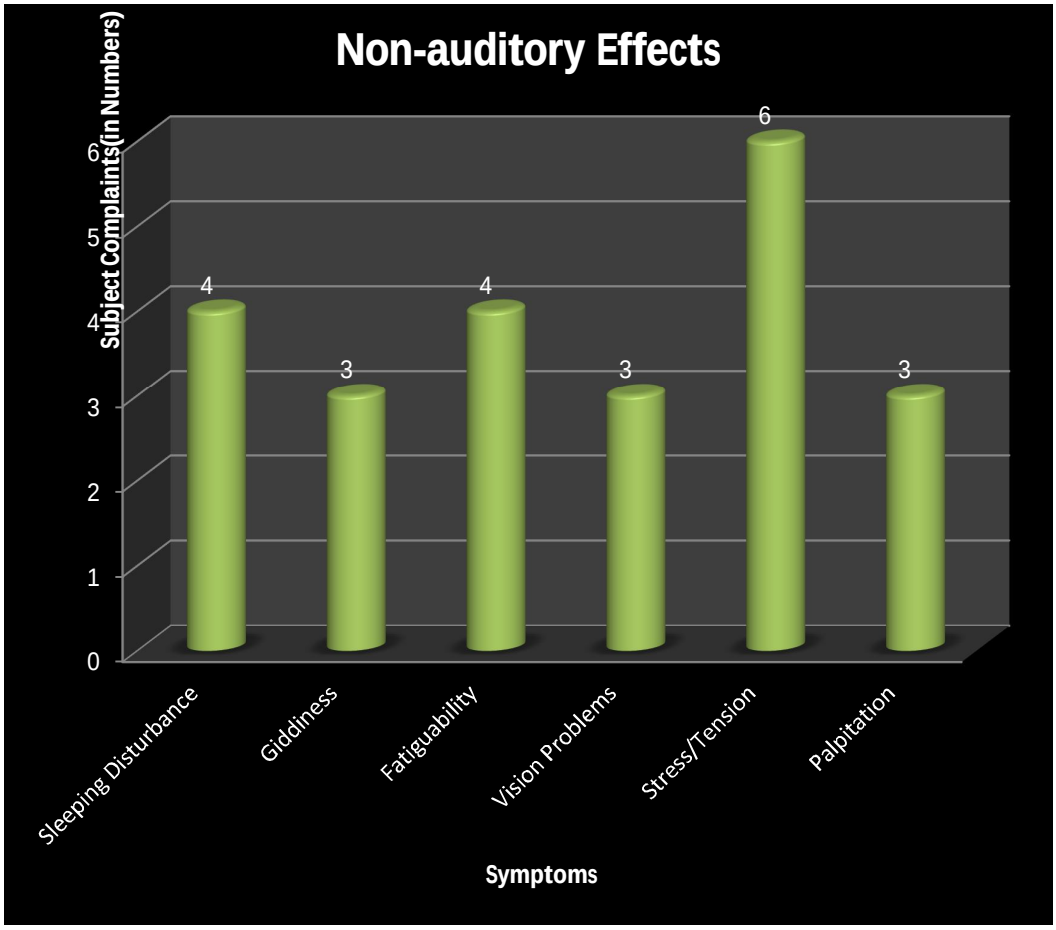

Fig:21. Individual Symptoms – Non –Auditory Effects

Above figure shows that among the participants 6 had stress/tension, 4 had fatigue ability, 4 had sleeping disturbances, 3 had palpitations, 3 had vision problems and 3 had giddiness.

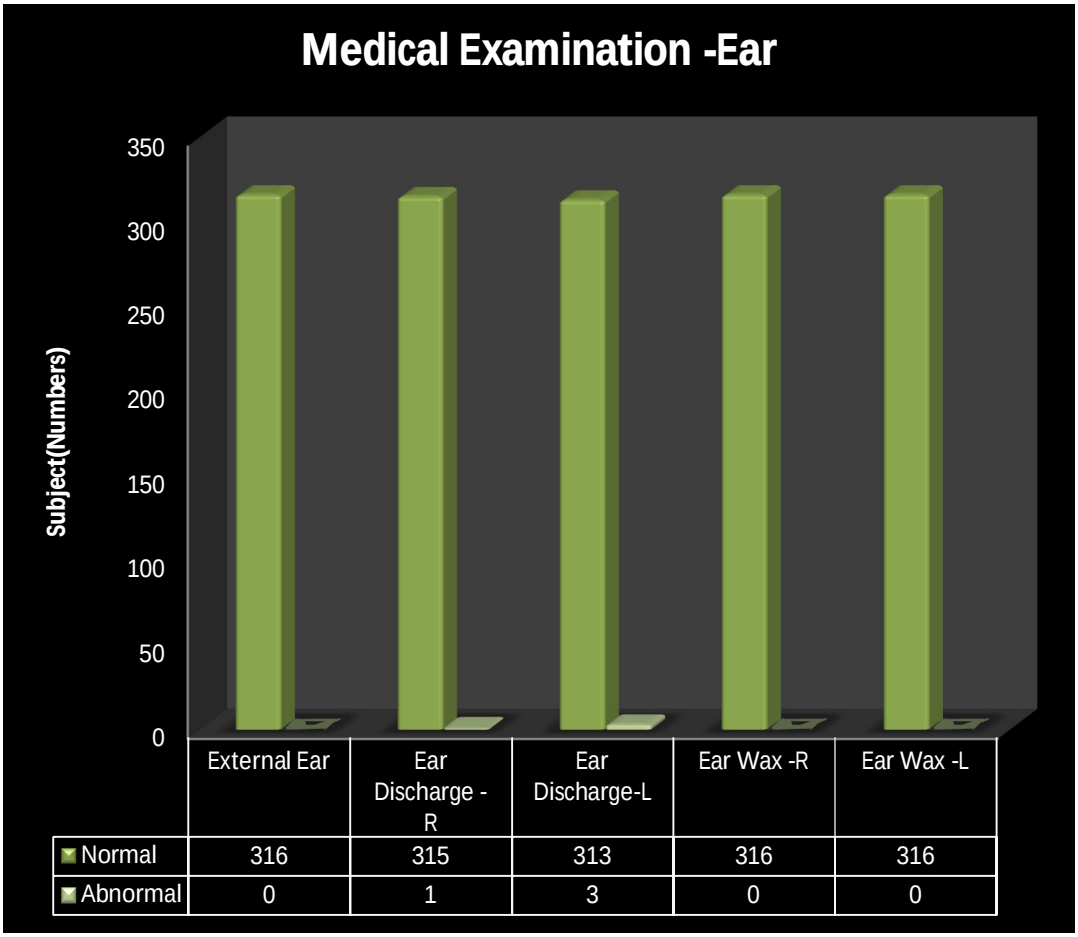

Fig: 22.Medical examination of ear

Above figure depicts that all the study population have got normal external ear and no wax in their ear canal. Only 1 had discharge in right ear and 3 had discharge in left ear.

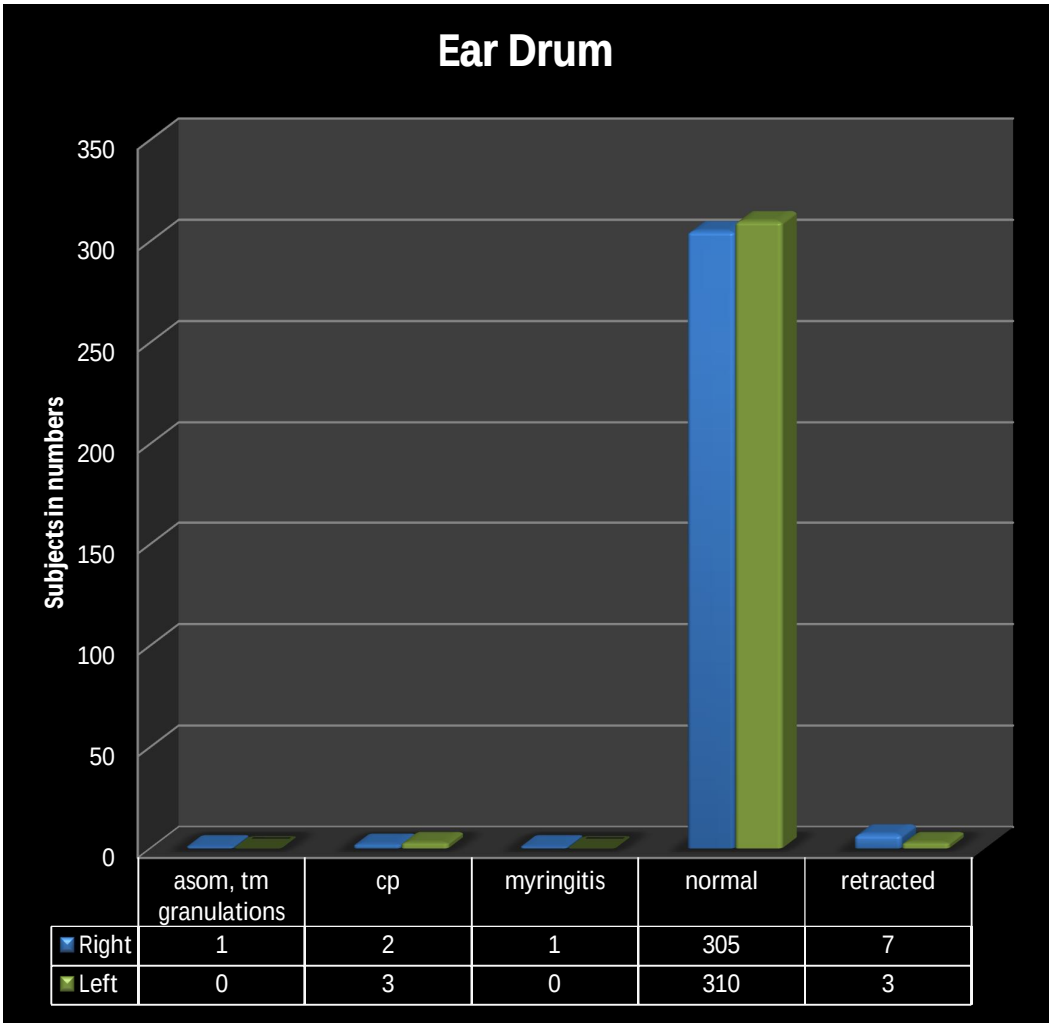

Fig: 23.Ear Drum Appearance

Above figure depicts that 310 study subjects have normal tympanic membrane in left ear and 305 subjects in right ear. 3 have central perforation in left ear and 2 in right ear. 3 have retracted tympanic membrane in left ear and 7 in right ear.

Table 9: Association of demographic details, environmental factors, medical factors and drug factors with hearing loss.

Sociodemographic profile				
Factors	**Category**	**No Hearing Loss**	**Hearing Loss**	**P value**
Individual Characteristics				
1. Age Groups	Less than 38 years	278(94.2%)	15(71.4%)	0.002
	More than 38 years	17(5.8%)	6(28.6%)	
2. Sex	Male	290(98.3%)	21(100%)	0.707
	Female	5(1.7%)	0(0)	
3. Education	Illiterate	8(2.4%)	1(4.8%)	
	Primary	4(1.4%)	1(4.8%)	
	Middle school	48(16.3%)	4(19%)	
	High school	50(16.9%)	4(19%)	
	Higher secondary/ Diploma/ITI	98(33.2%)	7(33.3%)	
	Under graduate/Post graduate	87(29.5%)	4(19%)	
4. Socio economic status	Upper	295(100%)	20(95.2%)	0.066
	Upper middle	0(0)	1(4.8%)	

Environmental/ work related factors				
1. Type of work	Skilled	240(81.4%)	20(95.2%)	0.233
	Clerical / Administrative / Executive / Non-field staff	55(18.6%)	2(9.5%)	
2. Work experience	Less than 2 years	182(61.2%)	8(38.1%)	0.03
	More than 2 years	113(38.3%)	13(61.9%)	
3. Pre placement audiogram	Yes	15(5.1%)	0(0)	0.348
	No	280(94.9%)	21(100%)	
4. Periodical audiogram	Yes	22(7.55)	3(14.3%)	0.225
	No	273(92.5%)	8(85.7%)	
5. Noise exposure previous working station	Yes	24(8.1%)	2(9.5%)	0.532
	No	271(91.9%)	19(90.5%)	
Medical factors and family factors				
1. History of systemic Hypertension	Yes	4(1.4%)	1(4.8%)	0.293
	No	291(98.6%)	20(95.2%)	
2. Family history of Hard of Hearing	Yes	0	0	
	No	295(100%)	21(100%)	
Drug Factors				
1. Ototoxic drugs like streptomycine , quinine	Yes	0	0	
	No	295(100%)	21(100%)	

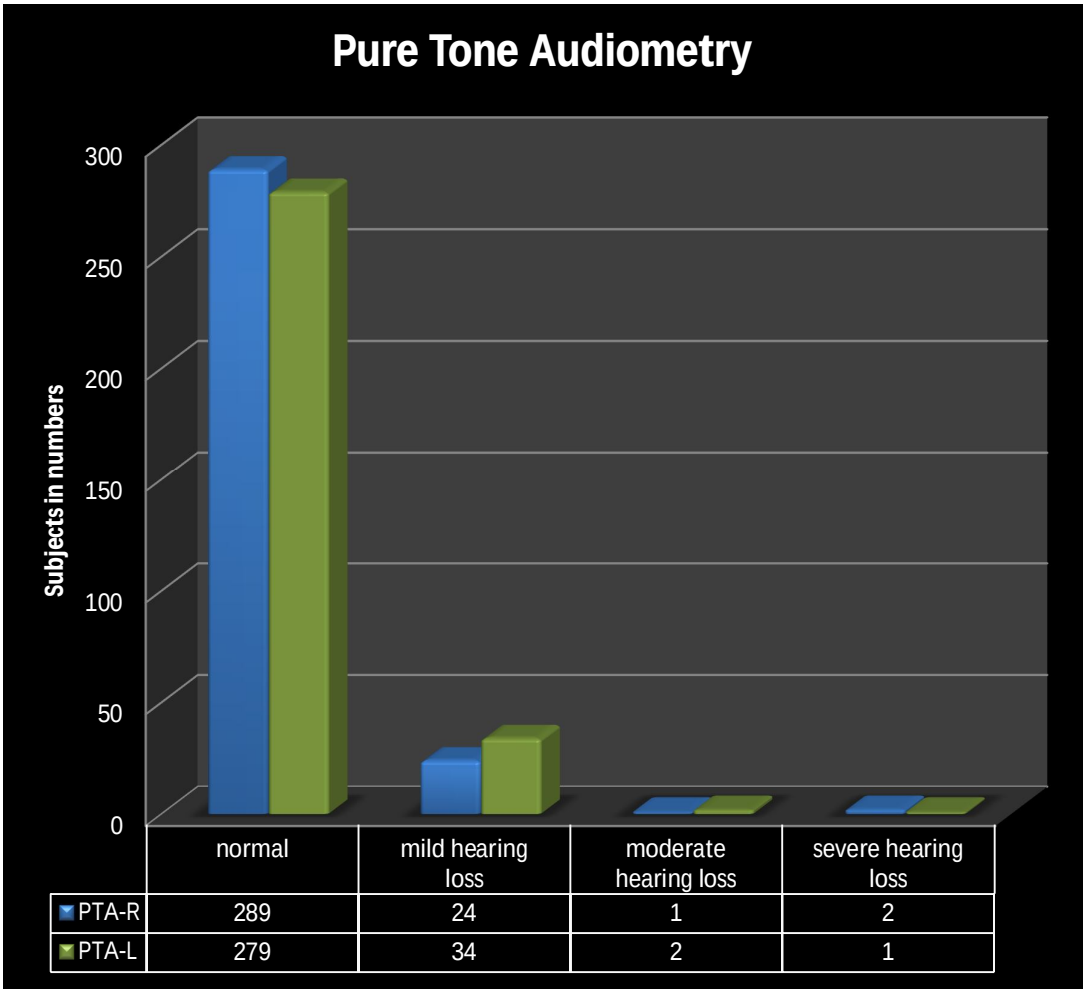

Fig. 24. Pure tone audiometry showing various degrees of hearing loss.

Above figure shows various degrees of hearing loss calculated by pure tone average. Among the study subjects 289 had normal hearing, 24 had mild hearing loss,1 had moderate hearing loss and 2 had severe hearing loss in their right ear. This figure also shows that 279 had normal hearing, 34 had mild hearing loss,2 had moderate hearing loss and 1 had severe hearing loss in their right ear.

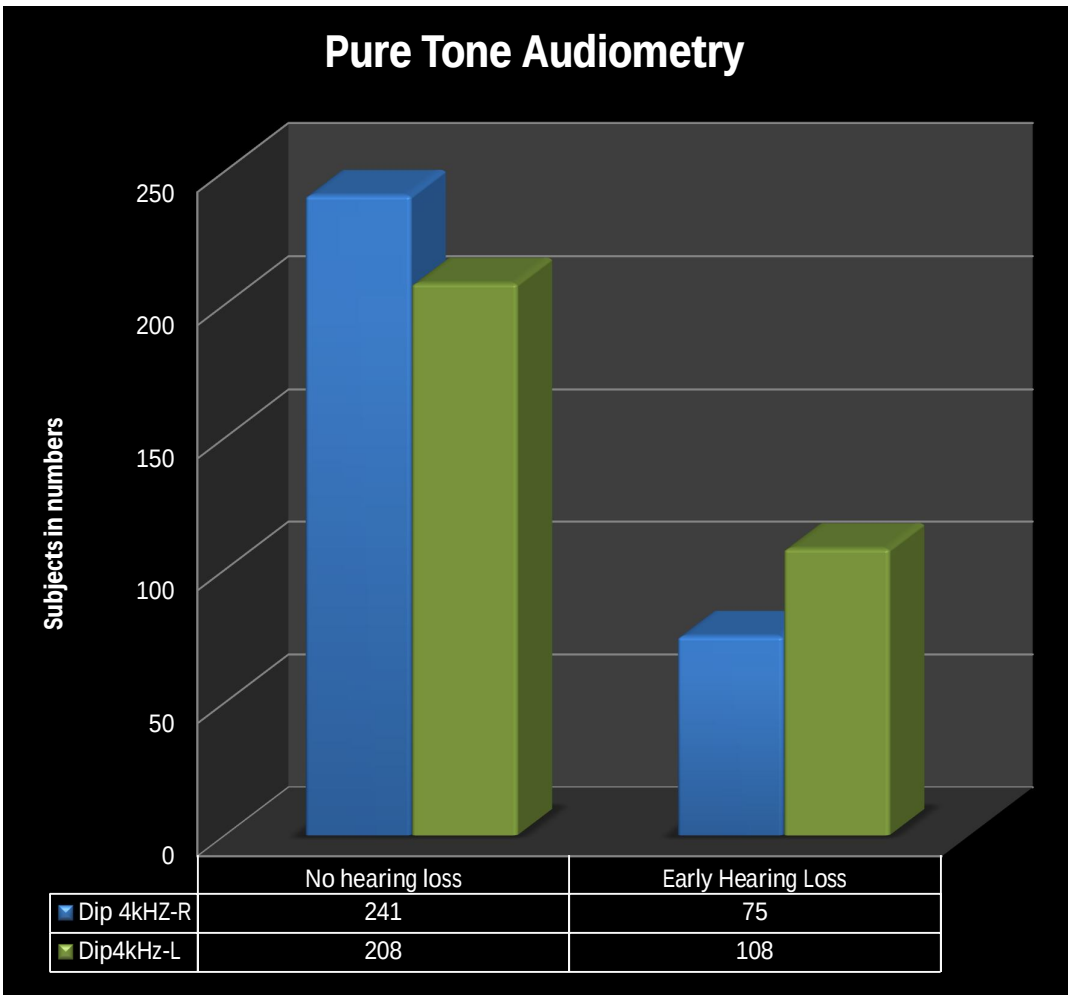

Fig. 25. Pure tone audiometry showing early hearing loss in dip 4khz

Above figure shows early hearing loss calculated by dip in 4khz in pure tone average. Among the study subjects 75 (23.7%) had early hearing loss in Right ear and 108(34.2%) had early hearing loss in left ear.

Discussion

8. DISCUSSION

The current study was carried out in two industries located at Kanchipuram district, Sriperumbudhur area to assess the prevalence of hearing loss among automobile industrial workers and to determine the risk factors associated with hearing loss using Pure Tone Average based on the audiogram.

Based on the details obtained from the Director of Industrial Safety and Health database, there were totally 10 large scale automobile industries in the Kanchipuram district and the study was conducted in two large scale automobile industries selected randomly. There were totally 316 study participants from two industries. One to one survey was conducted using the semi structured questionnaire and audiogram was done by Pure Tone Audiometer by a qualified audiometrist for those enrolled participants.

Prevalence of Hearing loss:

The prevalence of hearing loss was assessed based on audiogram findings by pure tone average in both Right and Left ears and early hearing loss was assessed using a dip in 4khz in PTA. The prevalence of hearing loss in our study among the automobile industrial workers was nearly 6.6% and early hearing loss with dip in 4khz was about 23.7% in Right ear and 34.2% in Left ear.

A study conducted in 2011 in an automobile manufacturing unit in Karachi, Pakistan showed the prevalence of hearing loss was about 25% were suffering from noise related hearing loss. According to WHO, globally, 16% of the automobile industrial workers were affected by disabling hearing loss. Approximately over 4 million DALYs is attributed to occupational noise, ranging from 7% to 21% in different regions. In our study the results were found to be nearer to the global prevalence. The published studies of NIHL in India are limited due to industrial regulations.

A study was conducted by Raja et al in a heavy engineering industry, which included machines shop and press divisions. The sound levels ranged from 83 to 116 dBA and the results published as hearing impairment was progressive in all the study groups[56].

Another study of 430 patients conducted by Srivastava et al at Bokaro Steel Plant found a 37% incidence of mild to severe sensorineural hearing loss.

An Indian Council of Medical Research (ICMR) report in 1983 found the proportion of hearing impairment to be 10.7%. A study by Kacker (1989) found hearing impairment to range from 13.5% to 18.5%. Sensorineural loss was more common in the urban population, whereas conductive loss was more common in the rural population[43].

In our study, those who were less than 38 years of age had a hearing loss of 71.4% compared to those who were more than 38 years of age and the difference was found to be statistically significant. Since, the young age group were employed in the noisy environment in automobile industries compared to the elderly persons.

Various studies were conducted in different industries ranging from textile mill, construction, printing, saw mills and crushers, drug and pharmaceutical company, foundry, traffic policemen, metallurgy, subway, railway tunnel found to have noise induced hearing loss ranging from 7 to 21%[57].In a study conducted by Bhattacharya et al among textile mill weavers, the hearing sound levels were around 102-104 dBA and the hearing acuity of the textile weavers was found to be poor. NIHL at 4000 Hz was as high as 30 dB in the age range 25-29 years, 40 dB in the age range 30-34 years and 45 dB in the age range 35-39 years[58.]

A 10 year study of noise-induced hearing loss in coalfield, steel plant, textile and pharmaceutical industry workers and natural oil and gas plants found that the amount of noise trauma depended on intensity and also on characteristics of noise, duration of exposure, physically, there is no difference between sound and noise. Sound is a sensory perception and noise corresponds to undesired sound.

Another study of 430 patients conducted by Srivastava at Bokaro Steel Plant found a 37% incidence of mild to severe sensorineural hearing loss.

A study was conducted in a drug and pharmaceutical company where the noise levels were 100-105 dBA. Significant NIHL was found in the workers[43.]

Percentage handicap of an individual = (Better ear%× 5) + (worse ear%) 6

10/28/2017 Occupational noise-induced hearing loss in India

A survey on the effects of noise pollution on traffic policemen in the city of Hyderabad, India, carried out by the Society to Aid the Hearing Impaired, revealed that 76% had NIHL. Among these, all those who had completed 5 years in the traffic wing had hearing loss in various degrees[44]

The National institute of miners' health (NIMH) has carried out NIHL studies in various mines. NIHL was prevalent among 12.8% of the employees. Moderate NIHL was detected in 10.2% and severe NIHL wasobserved in 2.6% of the employees[45]

There are other industries like construction, printing, saw mills and crushers where the workers are exposed to high levels of noise throughout their

lifetime of work. Studies regarding NIHL among the workers of these industries are not available.

Hearing loss caused by exposure to occupational noise results in a devastating disability. This is 100% preventable[58,59.] Noise induced hearing loss (NIHL) is the second most common type of the sensori neural hearing loss, after presbycusis[58.]

Audiometrically, Fowler[60] was the first person to comment on the 4 kHz dip produced by noise.

Middle ear's main function is to match the impedance of outer and inner ear. This system is a low-pass filter with a cut-off at around 1200 Hz, so it tends to attenuate high-frequencies above 4 kHz. That is why the sound detection at higher frequencies tends to be much worse than at lower frequencies.

Another explanation for the 4 kHz dip is that the external auditory canal (EAC) is a tube that is, closed at one end by the tympanic membrane. The acoustic resonance properties of the EAC can be explained in the following equation.

$f = v/4l$

Where,

f = resonant frequency

v = velocity of sound

l = length of tube (EAC).

The length of EAC is approximately 25 mm long; according to this equation the average resonance is around 3200 Hz. Thus, the resonant characteristics of the EAC help determine the acoustic energy delivered to the cochlea[61] For example, industrial noise typically has a broad spectrum; however, as it travels through the EAC, acoustic energy in the mid frequency range resonates or is amplified, creating a band-pass noise centered at 3200 Hz. Hence, it is typical to see a "4 kHz notch" in audiograms of subjects with NIHL which is about half octave above the middle frequency of the noise.

Henderson and Hamernick (1995)[61] also cited studies that have found that the basilar membrane of cochlea vibrations show maximum displacement at half an octave over the stimulation frequency. The study found that the frequencies where NIHL occurs and depends on the anatomy of the patient's outer ear.

Everyone’s outer ear is not 25 mm long, so the NIHL may vary in which frequencies are affected. That is, why a little variation in the notch sometimes from 3 to 6 kHz is observed. It is important to know that early onset of NIHL may only affect very small bands of frequencies[61] so very large jumps in frequencies while testing may not be suitable in detecting the early onset subjects. Hence,

when testing for the early onset, it is important to use narrow frequency changes in the high range and small dB changes. It was found that even if the workers showed normal hearing, when calculated as average of all the tested frequencies taken together but they have started developing the early changes of NIHL in the form of audiometric notching at 4000 Hz frequency.

In our study, we have studied the 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz frequency with small changes in the intensity of sound.

In a study conducted by Wilson et al, it was seen that 198 right ears out of the total 341 studied showed audiometric notching >25 dB in 4 kHz frequency, even then 70 (35.35%) right ears showed hearing in normal range and 119 (60.10%) and 9 (4.55%) were found to be in mild and moderate range, respectively.

Right ears which did not showed audiometric notching at 4 kHz, 133 (93.01%) were having hearing in the normal range, and only 10 (6.99%) were having mild hearing loss. In case of 198 left ears out of the total 341 studied showed audiometric notching >25 dB in 4 kHz frequency, even then 97 (48.99%) left ears showed hearing in normal range and 94 (47.47%%) and 7 (3.54%) were found to be in mild and moderate range, respectively. Left ears which did not showed audiometric notching at 4 kHz, 88 (61.54%) were having hearing in

normal range and 51 (35.66%) and 4 (2.8%) were having hearing in mild and moderate category, respectively.

In our study, based on the Pure Tone Audiogram, which showed early hearing loss which was calculated by dip in 4khz in pure tone average. Among the study subjects 75 (23.7%) had early hearing loss in Right ear and 108(34.2%) had early hearing loss in left ear.

NIHL is characterized by the high-frequency hearing loss that may display a high-frequency notch in the audiogram[62,63,64.]

Barrs et al65 found minimal NIHL notch at 3–6 kHz in approximately one-third (37%) of the workers in their study even though they had no symptoms.

The results of Oleru et al[66] study, 1990, on hearing thresholds in an auto assembly plant in a Nigerian factory have shown that NIHL among workers usually occurs at higher frequencies. Similarly, NIHL at a frequency of 4000 Hz is more than that at 1000 and 2000 Hz.

Hearing loss in workplaces starts at 4000 Hz and is then directed towards higher and lower frequencies[67]

It was shown that in workplaces with high SPL, there was a meaningful relationship with increase in NIHL (odd's ratio = 4.25) and the rate of NIHL at frequency of 4000 Hz was more than other frequencies[68.]

Our results were comparable to other published studies, which also show the audiometric notching in pure tone audiometry finding but no hearing impairment when calculated by taking average of all the frequencies tested, as shown in.

Regardless of the exact cellular mechanism, several phenomena related to loud noise do appear to be well-established. Damage within the cochlea tends to occur initially and to the greatest degree in the portion which detects sound in the 4000 Hz range. This progresses steadily over the initial decade of exposure and then tends to plateau. Typically, the next affected area is in the 6000 Hz region followed by the 8000 and the 2000 Hz regions where losses are more slowly progressive[69]

Table: Percent of disability[70]

Category	*Type of Impairment*	*PTA of Better Ear in dBHL*	*Speech Discrimination Score of Better Ear*	*Percentage of Disability*
I	Mild	26-40	80-100%	< 40%
II(a)	Moderate	41-60	50-80%	40-50%
II(b)	Severe	61-70	40-50%	51-70%
III(a)	Profound	71-90	<40%	71-100%
III(b)	Total	>91	Very Poor	100%

In India, NIHL has been a compensable disease since 1948 under the Employees State Insurance Act (1948) and the Workmen's Compensation Act (1923). However still there is very less awareness regarding this fact. Nearly 3 billion dollars has been paid as compensation for NIHL in the USA in the last two decades. In India, it was only in the year1996 that the first case got compensation and about 250 workers are receiving compensation for NIHL[71].

In our study, based on the Pure Tone Audiogram, various degrees of hearing loss was calculated. Among the study subjects 289 had normal hearing, 24 had mild hearing loss,1 had moderate hearing loss and 2 had severe hearing loss in their right ear. This figure also shows that 279 had normal hearing, 34 had mild hearing loss,2 had moderate hearing loss and 1 had severe hearing loss in their right ear.

Summary & Conclusion

9. SUMMARY AND CONCLUSION

The current study was carried out in two industries located at Kanchipuram district, Sriperumbudhur area to assess the prevalence of hearing loss among automobile industrial workers and to determine the risk factors associated with hearing loss using Pure Tone Average based on the audiogram.

Based on the details obtained from the Director of Industrial Safety and Health database, there were totally 10 large scale automobile industries in the Kanchipuram district and the study was conducted in two large scale automobile industries selected randomly. There were totally 316 study participants from two industries. An interview based semi-structured questionnaire was used to collect the data regarding the socio demographic details followed by clinical examination of ear and pure tone audiometry was done by Pure Tone Audiometer by a qualified audiometrist for those enrolled participants. Noise induced hearing loss is preventable. Noise is a most important cause of adult onset hearing loss. The burden of hearing loss in India caused by excessive noise at work has many consequences for individual and society. Multiple factors are contributing to occupational NIHL but major contributor is lack of prevention.

The study revealed the following

The prevalence of hearing loss was assessed based on audiogram findings by pure tone average in both Right and Left ears and early hearing loss was assessed using a dip in 4khz in PTA.

The prevalence of hearing loss in our study among the automobile industrial workers was nearly 6.6% and early hearing loss with dip in 4khz was about 23.7% in Right ear and 34.2% in Left ear.

The various risk factors as independent variables in univariate analysis, factors like socio-demographic factors and work related factors of automobile industrial workers such as age, gender, literacy, type of work, address, nature of work, duration of work , shift work, pre placement audiogram, annual hearing check-up and monthly income were analysed. Among the various risk factors age group category (< 38 years versus >38 years), and Work experience (<2 years and > 2 years) were found to have hearing loss based on Pure Tone Average and which was found to be statistically significant.

The other information such as medical history of the automobile industrial workers regarding the history of high blood pressure, details ear morbidity and the usage hearing protection devices (HPD) and clinical Examination of the

individual such as blood pressure measurement, pure tone audiogram and ear examination findings were found in percentage.

This study establishes the importance of noise induced hearing loss among automobile industrial workers based on the age group and work experience which shows that younger the age group and prolonged exposure in terms of work experience in the field were found to have noise induced sensorineural hearing loss.

Other confounding factors such as ototoxic drug intake such as streptomycin and quinine, family history of hard of hearing and history of known hypertension were included in the analysis but not found to have statistical significance in hearing loss.

Occupational exposure to noise can be reduced by reducing the noise at the source. Hearing loss prevention programs should include: noise control at workplace, periodic noise assessments, periodic audiometric monitoring to workers, and appropriate use of hearing protection devices (HPD), worker's education, record keeping and program evaluation. National hearing loss prevention programs needs commitment and resources.

There is an urgent need of the Government to take necessary practical steps for implement it strictly so that occupational noise hearing loss can be prevented.

Limitations

10. LIMITATIONS

- The study was carried out only in automobile industries of Kancheepuram District. It may not represent the problem of other type of industries in this locality.

- The study was carried out only 2 automobile industries of Kancheepuram District, so this may not represent the problem of all the automobile industries.

- The workers of automobile industries were absent not included in the study.

- Sample size may not be adequate to find out the association between dependant and independent variables.

- Further research to be undertaken on pathogenic mechanisms including risk factors and individual susceptibility with noise and environmental noise protection should be carried out.

- Research work to be undertaken on prevention of noise induced hearing loss should include engineering research on technical measures for noise abatement and improving hearing protectors for prevention.

Recommendations

11. RECOMMENDATIONS

- Study highlights the importance of employing younger people with prolonged exposure might have sensorineural hearing loss. Hence younger age should not be employed in field without proper preplacement examination.

- There is a real shortage of accurate epidemiological data relating to Noise induced hearing loss in India.

- Priorities to be addressed should include synthesis of existing data, prevalence and longitudinal surveys of significant noise exposure and NIHL, the development of effective screening methods for early identification of and intervention against NIHL and studies to determine the social and economic consequences of NIHL.

- Various risk factors to be identified as a causative factor for hearing loss should be studied in detail.

- National Programmes should be strengthened throughout the country. They should address general educational needs and particular risk situations.

- Collaboration with concerned NGOs and other interested parties should be fostered to support prevention at the community level.

- Need for increasing awareness about the hazardous effects of noise on hearing acuity among automobile industrial workers regarding the prevention and control of NIHL, including strict strengthening of legislation.

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Annexures

ANNEXURE-1

INFORMATION SHEET

Title of the study: "A cross sectional study on the prevalence of hearing loss among automobile industrial workers in Kanchipuram District, Tamil Nadu - 2017"

Industrial workers are the most vulnerable sector of the society and a large number of them are working in poor occupational conditions in India.

Most of the industrial workers tend to suffer from a noise induced hearing loss. Based on previous studies on the prevalence of noise induced hearing is 16%. Health problems of industrial workers remained neglected since long time and there is a need to study the level of noise induced hearing loss and its social impact, health problems among industrial workers for their greater safety and health.

There is need to improve the living status and working conditions as well as to promote decent employment and income opportunities for industrial workers.

We request you to participate in this study. The privacy of the participants in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared. Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time.

The results of the study may be intimated to you at the end of the study period or during the study if anything is found abnormal which may aid in the management, treatment or prevention.

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अनुसंधान विवरण पत्र

अनुसंधान शीर्षक

2017 तमिलनाडु राज्य, कॉचीपुरम जिला, स्वचालित वाहन कारखाना, कर्मचारियों के सुनने संबंधित क्षमता कम होना संबंधित अनुसंधान

इस समाज में कारखाना में कार्यरत कर्मचारी अधिक बाधित व्यक्ति है। उनमें से अधिकतम व्यक्ति दुर्बल कारखाना वातावरण में कार्य कर रहे है । कारखानों में यंत्रों के कारण से उत्पन्न शोर के कारण कानों की सुनाई संबंधित क्षमता कम होने की संभावना है। पूर्व अनुसंधानों कोदेखने पर कान की सुनाई संबंधित कमी 16 प्रतिशत है। कारखानों में कार्यरत कर्मचारियों के स्वास्थ्य पर अधिक समय में ध्यान नहीं दिये जाने योग्य विषय है। कान की सुनाई न देने से समाज में बाधाएँ,शारीरिक बाधाएँ, उनकी सुरक्षा पर अनुसंधान करने की आवश्यकता उठ खडी होती है।

उनकी जीवनयापन स्थिति, कार्यकारी स्थिति को उन्नति करते हुए रोजगार तथा आमदनी को बढाना अत्यावश्यक हैं

मैं चाहता हूँ कि आप इस अनुसंधान में भाग लें और इसमें पूछे जानेवाले प्रश्नों का उत्तर दें।

आपको बताना चाहूँगा कि इस अनुसंधान के निष्कर्ष या निर्णयों को विमोचन करते वक्त या अनुसंधान के समय आपके नाम या पहचान चिन्हों को बाहरनहीं बताएँगे।

इस अनुसंधान में भाग लेना आपके विकल्प के अनुसार होगी। आगे आप किसी भी वक्त इस अनुसंधान से बिछुड सकते/सकती है।

इस अनुसंधान संबंधित निर्णय को अनुसंधान के समय या अनुसंधान की समाप्ति आपको बताया जाएगा इसे भी अभिव्यक्त करता हूँ ।

भाग लेनेवाले का नाम

भाग लेनेवाले काहस्ताक्षर

या बाएँ उंगली छाप

अनुसंधाता का नाम

अनुसंधाता का हस्ताक्षर

स्थान

तारीख

ANNEXURE-2

INFORMED CONSENT FORM

Title of the study: **"A cross sectional study on the prevalence of hearing loss among automobile industrial workers in Kanchipuram District, Tamil Nadu - 2017"**

Name of the participant:

Age/Sex:

1. I have been explained in detail about the study and its procedure. I confirm that I had completely understood the study and have had the opportunity to ask questions
2. I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without their medical care or legal rights being affected.
3. I understand that the principal investigator, others working on the investigator's behalf, the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. I agree to this access. However I understand that my identity will not be revealed in any information released to third parties or published.
4. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).
5. I agree to participate in the above study.

Signature of investigator	Signature or Thumb impression of participant
Date:	Date:

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अनुसंधान स्वीकृति पत्र

अनुसंधान शीर्षक

2017 तमिलनाडु राज्य, कॉचीपुरम जिला, स्वचालित वाहन कारखाना, कर्मचारियों के सुनने संबंधित क्षमता कम होना संबंधित अनुसंधान

नाम : आयु :

अनुसंधान प्रवेश सं लिंग

मैं इस अनुसंधान संबंधित विवरण उपलब्ध विवरण पत्रिका को प्राप्त कर लिया।

इस अनुसंधान संबंधित विवरण तथा उसके लक्ष्य के बारे में मुझे पूर्ण रूप से बताया गया।

मुझे दिये गये स्पष्टीकरणों को समझकर मैं पूर्ण सहमति प्रदान करता/करती हूँ।

इस अनुसंधान में दूसरों से दबाव के बिना, अपने ही इच्छा से भाग ले रहा/रही हूँ। इस अनुसंधान से किसी भी समय मैं बिछुंड सकता हूँ और इससे मुझे कोई बाधा नहीं होगा/होगी इसे मैं समझ लिया।

मैं अपने आत्म–चेतन तथा पूर्ण–स्वतंत्रता के साथ इस चिकित्सीय अनुसंधान में भाग लेने सहमति प्रदान करता/ करती हूँ ।

अगर मै। इस अनुसंधान से बिछुड जाऊँ तो भी मुझसे अनुमति लिये बिना अनुसंधाता या उसके व्यक्ति, प्रोटोकॉल समूह सदस्य, मेरे/ मेरी शरीर से संबंधित विवरण को इस अनुंसंधान के लिए या इससे संबंधित अन्य किसी अनुसंधान के लिए उपयोग कर सकते है, इसे जानकारी के साथ ही सहमति प्रदान कर रहा/रही हूँ। पर भी मेरे/ मेरी पहचान प्रकट नहीं किया जाएगा इसे भी समझता हूँ ।

इस अनुसंधान विवरण, निर्णय को वैज्ञानिक उद्देश्य हेतु उपयोग करने के लिए मैं सहमति प्रदान करता/ करती हूँ । मैं इस अनुसंधान में भाग लेने पूर्ण सहमति प्रदान करता/ करती हूँ।

भाग लेनेवाले का नाम भाग लेनेवाले का हस्ताक्षर

या बाएँ उंगली छाप

अनुसंधाता का नाम अनुसंधाता का हस्ताक्षर

स्थान तारीख

ANNEXURE-3

QUESTIONNAIRE

Section I : Personal Details / Socio Demographic details

1) Name :

2) Age :

3) Gender : Male / Female

4) Mobile No / Telephone No :

5) Address :

6) Education Illiterate : ☐Primary school ☐Middle school ☐High school ☐Higher Secondary school ☐Diploma ☐Graduate ☐Post Graduate

7) How long you have been working in this company

8) Nature of work

9) Shift work : ☐Yes ☐No

10) Whether pre placement audiogram done? ☐Yes ☐No

11) Whether annual audiogram done? ☐Yes ☐No

12) Monthly Income :

13) Previous work station : ☐Yes ☐No

Section II : Medical History

14) Hypertension : ☐Yes ☐No ☐How Long?

15) Have you ever had ear discharge, ear pain in your childhood / young age?
☐Yes ☐No

16) Have you ever had injury to ears?
☐Yes ☐No

17) Did your family members affected by hearing disability?
☐Yes ☐No

18) Have you ever had streptomycin, quinine medicines? ☐Yes ☐No

19) Do you have sleep problems? ☐Yes ☐No

20) Do you have giddiness often? ☐Yes ☐No

21) Do you have tiredness often? ☐Yes ☐No

22) Do you have any vision disturbance? ☐Yes ☐No

23) Do you have any mind disturbance often? ☐Yes ☐No

24) Do you have palpitation often? ☐Yes ☐No

25) Do you have headache often? ☐Yes ☐No

26) Have you been provided with hearing protective equipments? ☐Yes ☐No

27) Have you been wearing ear muff regularly? ☐Yes ☐No

28) Have you been wearing ear plug regularly? ☐Yes ☐No

29) Have you been wearing canal cap regularly? ☐Yes ☐No

30) If no, why?

Section III : Medical Examination

31) Blood pressure measurement

32) Ear examination

S. No.	Findings	Yes / No	Right Ear	Left Ear
1)	External ear deformity			
2)	Ear Wax			
3)	Ear Discharge			
4)	Ear drum			

33) Whether audiogram test done or not? ☐Yes ☐No

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30) CÀø»GÛÀPõµn®GßÚ?

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31) Cµzu AÊzu£¶÷\õuøÚ
32) Põx£¶÷\õuøÚ

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33) Bi÷¯õQµõ®£¶÷\õuøÚö\´¯¨£mkÒÍuõ? ☐B®☐CÀø»

प्रश्न प्रारूप

भाग 1 : निजी व्यक्ति का विवरण/ सामूहिक आर्थिक स्थिति

1. नाम :
2. आयु :
3. लिंग : पुरुष/ स्त्री
4. दूरभाष/ मोबाइल सं. :
5. पता
6. शैक्षिक योग्यताएँ : ☐ अनपढे
   ☐ प्रारंभिक स्कूल ☐ माध्यमिक स्कूल
   ☐ हाई विद्यालय ☐ हायर सेकन्डरी स्कूल
   ☐ डिप्लोमा ☐ स्नातक शिक्षा
   ☐ स्नातकोत्तर शिक्षा
7. आप कितने अवधि से इ स कारखानामें कार्य कर रहे हो?
8. पेशा की प्रकृति
9. पेशा घुमाव ☐ हॉ ☐ नहीं
10. क्या रोजगार में जुडने के पूर्व ही आंडियोग्राम किया गया है?
    ☐ हॉ ☐ नहीं
11. क्या वर्ष में एक बार आडियोग्राम किया जा रहा है?
    ☐ हॉ ☐ नही
12. मासिक आय :
13. पिछले पेशा : ☐ हॉ ☐ नहीं

भाग 2 : चिकित्सीय इतिहास

14. रक्तचाप रोग : ☐ हॉ ☐ नहीं
15. आपके शिशु पर्व में/ युवा पर्व में कानों में मवाद आना, कान में दर्द रहा क्या?
    ☐ हॉ ☐ नहीं

16. कानों में घाव पडा है क्या ?

हॉ ☐ नहीं ☐

17. क्या परिवार में किसी सुनने में कोई समस्या है?

हॉ ☐ नहीं ☐

18. आप अब तक स्ट्रेप्टोमाइसिन, कुयनिन जैसे औषधियों को लिया है क्या?

हॉ ☐ नहीं ☐

19. क्या आप अनिद्रा की समस्यास है?

हॉ ☐ नहीं ☐

20. क्या अक्सर आप बेहोश हो जाते हैं?

हॉ ☐ नहीं ☐

21. क्या अक्सर थक जाते हैं?

हॉ ☐ नहीं ☐

22. क्या ऑखों की दृष्टि में कोई समस्या है?त्र

हॉ ☐ नहीं ☐

23. क्या अक्सर डिप्रेशन में पड जाते हैं?

हॉ ☐ नहीं ☐

24. क्या अक्सर अतिस्पंदन हो जाती है?

हॉ ☐ नहीं ☐

25. क्या अक्सर सिर दर्द होती है?

हॉ ☐ नहीं ☐

26. क्या अब जहॉ कार्यरत है वहॉ सुनने के लिए उपकरण/ सुनाई देने संबंधित अनुभूति संबंधित सुरक्षा उपकरण दिया गया है?

हॉ ☐ नहीं ☐

27. कान सुनाई देने संबंधित सुरक्षा कान मफ पहनना

हॉ ☐ नहीं ☐

28. कान सुनाई देने संबंधित सुरक्षा कान प्लग पहना है?

हॉ ☐ नहीं ☐

29. कान सुनाई देने संबंधित सुरक्षा केनल केप पहना है?

हॉ ☐ नहीं ☐

30. नहीं तो क्यों ?

हॉ ☐ नहीं ☐

भाग3 : चिकित्सीय परीक्षण

31. रक्त चाप परीक्षण

हॉ ☐ नहीं ☐

32. कान का परीक्षण

	जॉच–पडताल में	हॉ /नहीं	दाएँ कान	बाएँ कान
1	बाह्य कान में परिवर्तन			
2	कानों में गंदापन			
3	कानों में मवाद			
4	कान झिल्ली			

33. आडियोग्राम परीक्षण किया गया है?

हॉ ☐ नहीं ☐

ANNEXURE 4

REVISION OF MODIFIED B.G.PRASAD'S SES CLASSIFICATION

The BG Prasad's scale was formulated in1961 keeping the base Consumer Price Index (CPI) for 1960 as 100[33, 34]. This was revised in 1982 by introducing a linking factor of 4.93 to convert CPI (1982) from the new base of 100 to old base of CPI (1960). Again a need was felt in 2001 to revise the base, which was done by introducing the linking factor of 4.63. These linking factors have been given by Labour Bureau[35]. To calculate the new income values, first we have to find out the All India Consumer Price Index (AICPI) for industrial workers (CPI-IW; Base 2001=100). Then we have to calculate multiplication factor which is given by following equation.

Multiplication factor = Current index value/base index value in 2001 i.e. 100.
As the study was done in rural area, modified B.G. Prasad's classification was used for socio economic classification.

The calculation was done as follows:
Consumer Price Index (CPI) for industrial workers (IW) in Chennai for the month of august 2017 is rupees 263. (Base, 2001= 100).

The new income value can now be calculated by using the following equation[32, 33].

Where, 4.63 and 4.93 are the linking factors given by the Labour bureau[35].

Multiplication factor = Value of Consumer Price Index X 4.63 X 4.93/100
= 263X 4.63 X 4.93/100= 60.03

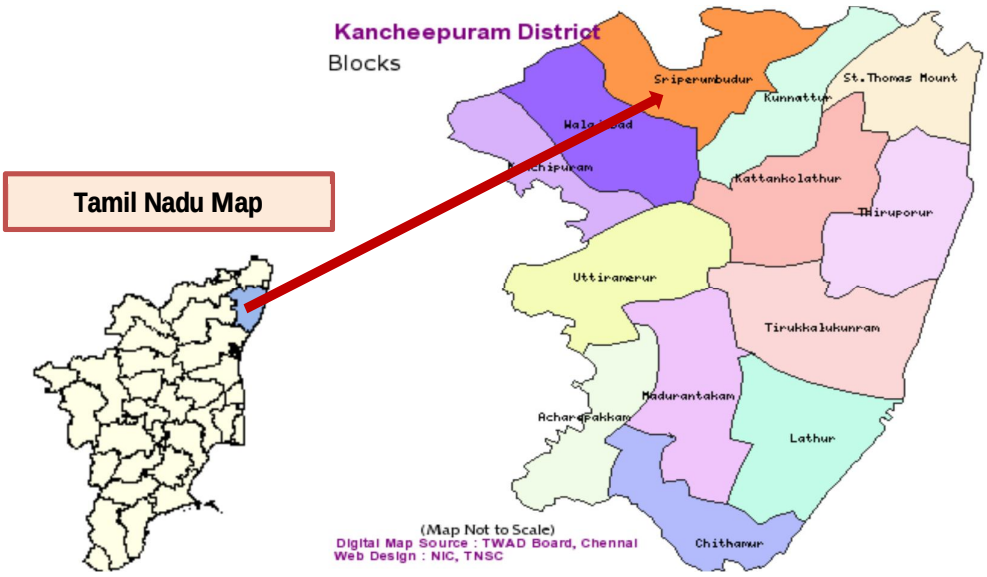
Modified BG Prasad's classification for August 2017 =

Per capita income in 1961 X Multiplication Factor

Socio Economic Class	Old classification 1961 Per capita monthly income limits in rupees	Income August 2017 Per capita monthly income limits in rupees
I(Upper Class)	100 & Above	≥6003
II(Upper Middle Class)	50-99	2943-6002
III(Middle Class)	30-49	1742-2942
IV(Lower Middle Class)	15-29	901- 1741
V(Lower Class)	<15	<900

ANNEXURE 5

STUDY AREA MAP



ANNEXURE 6

SAMPLING FRAME

The current study was carried out in two industries located at Kancheepuram district, Sriperumbudhur area to assess the prevalence of hearing loss among automobile industrial workers and to determine the risk factors associated with hearing loss using Pure Tone Average based on the audiogram.

In first stage, based on the details obtained from the Director of Industrial Safety and Health database, in Kanchipuram district totally 7 taluks were shortlisted and based on sample size requirement for our study, Sriperumbudhur taluk was selected randomly.

Total Number of Large scale Automobile Factories in Kancheepuram District shortlisted by Director of Industrial Safety and Health database:

First stage: Taluk was selected randomly

S.No	Taluk name	Total Number Of Automobile Industries
1.	Chengalpattu	3
2.	**Sriperumbudur**	5
3.	Kancheepuram	2
	Total	10

Second stage:

In second stage, from the Sriperumbudhur taluk, there were totally 5 large scale automobile industries, **two large scale Automobile Industries were selected randomly**. Among the two automobile industries, consent was obtained and 316 study participants were enrolled for the current study.

ANNEXURE-7

KEY TO MASTER CHART

VARIABLE	LABEL	CODING
PARTICIPANT ID	Participants ID details	
AGE	Age of the individual	
SEX	Sex of the individual	1- Male 2- Female
EDUCATION	Educational status of individual	0- Illiterate 1- Primary 2- Secondary 3- Middle school 4- High school 5- Higher secondary / diploma / ITI 6- Under graduates / post graduates
TOTAL MONTHLY INCOME	Total monthly income of the individual	
FAMILY MEMBERS	No. of Family members in the household	
PER CAPITA INCOME	Per capita income of the individual	
SOCIO ECONOMIC STATUS	Socio economic status of individual	1- Upper class 2- Upper middle class 3- Middle class 4- Lower middle class 5- Lower class
WORK EXPERIENCE	Work experience of individual	
TYPE OF JOB	Type of job of that individual	
SHIFT WORK	Shift work of that individual	1- Yes 2- No
PREPLACEMENT AUDIOGRAM	Preplacement audiogram of the individual	1- Yes 2- No
PERIODICAL AUDIOGRAM	Frequency of periodical checkup of audiogram	1- Yes 2- No
NOISE EXPOSURE PREVIOUS WORKING STATION	Any noise exposure in previous working place	1- Yes 2- No
NOISE EXPOSURE EXPOSURE DURATION	Noise exposure duration , if any previous exposure	
HYPERTENSION HISTORY	History of hypertension	1- Yes 2- No
DURATION OF HYPERTENSION	Duration of hypertension, if history of hypertension	
HISTORY EAR DISCHARGE	History of ear discharge	1- Yes 2- No
DURATION EAR DISCHARGE	Duration of ear discharge, if history of ear discharge	
HISTORY EAR PAIN	History of ear pain	1- Yes 2- No

DURATION OF EAR PAIN	Duration of ear pain, if history of ear pain	
HISTORY EAR TRAUMA	History of ear trauma	1- Yes 2- No
FAMILY HISTORY HARD OF HEARING	Family history of hard of hearing of that individual	1- Yes 2- No
OTOTOXIC DRUG INTAKE STREPTOMYCIN , QUININE	Ototoxic drug intake of streptomycin , quinine	1- Yes 2- No
SLEEPING DISTURBANCE	History of Sleeping disturbance of the individual	1- Yes 2- No
GIDDINESS	History of giddiness of the individual	1- Yes 2- No
FATIGUABILITY	History of fatiguability of the individual	1- Yes 2- No
VISION PROBLEMS	History of vision problems of the individual	1- Yes 2- No
STRESS TENSION	History of stress of the individual	1- Yes 2- No
PALPITATION	History of palpitation of the individual	1- Yes 2- No
HEADACHE	History of head ache of the individual	1- Yes 2- No
NON AUDITORY EFFECTS	Non auditory effects of the individual	1- Yes 2- No
PROVISION HPD	Provision of hearing protective device	1- Yes 2- No
EAR MUFF	Usage of ear muff	1- Yes 2- No
EAR PLUG	Usage of ear plug	1- Yes 2- No 3- Not applicable
EAR CANAL CAP	Usage of ear canal cap	1- Yes 2- No
REASON NOT USING HPD	Reason for not using HPD	1- Using 2- Allergic 3- Irritation 4- Pain 5- Not applicable
SYSTOLIC BP	Systolic blood pressure of the individual	
DIASTOLIC BP	Diastolic blood pressure of the individual	
MEDICAL EXAMINATION HTN	Hypertension during examination of the individual	1- Yes 2- No
EXTERNAL EAR ABNORMALITY RIGHT	external ear abnormality right	1- Normal 2- Abnormal
EXTERNAL EAR ABNORMALITY LEFT	external ear abnormality left	1- Normal 2- Abnormal
EAR WAX RIGHT	Right ear wax	1- Wax Present 2- Wax Absent
EAR WAX LEFT	Left ear wax	1- Wax Present 2- Wax Absent

EAR DISCHARGE RIGHT	Right ear discharge	1- No discharge 2- Discharge present
EAR DISCHARGE LEFT	Left ear discharge	1- No discharge 2- Discharge present
EAR DRUM RIGHT	Examination of right ear drum	1- Normal Appearance 2- ASOM,TM Granulations 3- Central Perforation 4- Myringitis 5- Retracted TM
EAR DRUM LEFT	Examination of left ear drum	1- Normal Appearance 2- ASOM,TM Granulations 3- Central Perforation 4- Myringitis 5- Retracted TM
AUDIOGRAM DONE	Audiogram done for the individual	1- Yes 2- No
PTA RT EAR	Pure tone audiometry of right ear	
PTA LT EAR	Pure tone audiometry of left ear	
PTA RT	Pure tone audiometry of right ear	1- Normal hearing 2- Hearing loss
PTA LT	Pure tone audiometry of left ear	1- Normal hearing 2- Hearing loss
DIP 4KHZ RT EAR	Dip at 4KHZ in PTA of right ear	1- No hearing loss 2- Early hearing loss
DIP 4KHZ LT EAR	Dip at 4KHZ in PTA of left ear	1- No hearing loss 2- Early hearing loss
SNHL RT	Sensory neural hearing loss for right ear	1- No SNHL 2- Mild SNHL 3- Moderate SNHL 4- Severe SNHL
SNHL LT	Sensory neural hearing loss for left ear	1- No SNHL 2- Mild SNHL 3- Moderate SNHL 4- Severe SNHL
COHL RT	Conductive hearing loss for right ear	1- No COHL 2- Mild COHL 3- Moderate COHL 4- Severe COHL
COHL LT	Conductive hearing loss for left ear	1- No COHL 2- Mild COHL 3- Moderate COHL 4- Severe COHL
MIXED HL RT	Mixed hearing loss of right ear	1- No mixed hearing loss 2- Mild mixed hearing loss 3- Moderate mixed hearing loss 4- Severe mixed hearing loss
MIXED HL LT	Mixed hearing loss of left ear	1- No mixed hearing loss 2- Mild mixed hearing loss 3- Moderate mixed hearing loss 4- Severe mixed hearing loss
HEARING LOSS	Hearing loss of the individual	1- No hearing loss 2- Hearing loss

ANNEXURE 8 - MASTER CHART

Participant ID	Age	Sex	Education	Monthly Income	Family Members	Percapita Income	Socioeconomic Status	Work Experience	Type of Job	Shift Work	Preplacement Audiogram	Periodical Audiogram	Noise exposure -Previous working station	Noise exposure duration	hypertension history	duration of hypertension	History Eardischarge	Duration ED	History Ear pain	Duration Earpain	History Ear trauma	Family History HOH	Ototoxic drugintake SM Quinine	Sleeping Disturbance	Giddiness	Fatiguability	Vision_problems	Stress_Tension	Palpitation	Headache	Non_auditory_effects	Provision_HPD	Ear_Muff	Ear_Plug	Ear_canal_cap	Reason_Not_using_HPD	Systolic_BP	Diastolic_BP	Medical Examination HTN	External Ear Abnormal Left	Ear_Discharge_Rt	Ear_Discharge_Lt	Ear_WAX_Rt	Ear_WAX_Lt	Ear_Drum_RT	Ear_Drum_LT	Audiogram_Done	PTA_Rt_Ear	PTA_Lt_Ear	PTA_RT	PTA_LT	Dip_4khz-Rt	Dip_4khz_Lt	SNHL_RT	SNHL_LT	COHL_RT	COHL_LT	MIXED_HL_RT	MIXED_HL_LT	Hearing Loss
1	45	1	post graduate	80000	4	20000	1	6	admin	1	2	2	2	0	1	12	2	0	2	0	2	2	2	2	2	2	2	2	2	3	2	3	2	5	130	90	2	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
2	27	1	post graduate	35000	3	11666.67	1	60	safety	1	1	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
3	23	1	under graduate	11000	4	2750	3	4	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	20	18	1	1	1	1	1	1	1	1	1	1	1
4	31	1	post graduate	50000	4	12500	1	24	admin	1	2	2	1	2	2	0	2	0	2	0	2	2	2	1	2	2	1	1	2	2	1	3	2	3	2	5	130	80	1	1	1	1	1	1	1	1	20	20	1	1	2	1	1	1	1	1	1	1	1
5	26	1	under graduate	14000	3	4666.67	2	2	admin	1	2	2	1	1	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
6	26	2	under graduate	30000	4	7500	1	60	admin	1	2	2	1	1	2	0	2	0	2	0	2	2	2	2	2	2	1	2	2	2	1	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
7	42	1	under graduate	100000	5	20000	1	5	admin	1	2	2	1	3	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	124	80	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
8	39	1	post graduate	80000	3	26666.67	1	1	admin	1	2	2	2	0	1	1	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	150	114	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
9	26	1	diploma	17000	4	4250	2	72	press shop	1	1	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	80	1	1	1	1	1	1	1	1	18	20	1	1	2	2	1	1	1	1	1	1	1
10	23	1	higher secondary	8700	3	2900	3	48	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	84	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
11	19	1	middle	8700	3	2900	3	60	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
12	21	1	under graduate	11000	3	3666.67	2	12	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	1	2	2	1	2	1	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
13	24	1	diploma	12000	3	4000	2	7	press shop	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	84	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
14	33	1	higher secondary	15000	4	3750	2	60	supervisor	1	1	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	84	1	1	1	1	1	1	1	1	20	21	1	1	2	2	1	1	1	1	1	1	1
15	36	1	high	10500	4	2625	3	60	fork lift driver	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	114	80	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
16	28	2	under graduate	11000	4	2750	3	30	security	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	20	23	1	1	1	2	1	1	1	1	1	1	1
17	36	1	under graduate	50000	4	12500	1	24	plant engineer	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	116	80	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
18	26	1	post graduate	30000	4	7500	1	36	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	100	70	1	1	1	1	1	1	1	1	20	23	1	1	1	1	1	1	1	1	1	1	1
19	24	1	middle	7000	3	2333.33	3	120	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	1	20	18	1	1	1	1	1	1	1	1	1	1	1
20	22	1	diploma	11000	3	3666.67	2	12	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	110	80	1	1	1	1	1	1	1	1	20	18	1	1	1	1	1	1	1	1	1	1	1
21	37	1	post graduate	50000	5	10000	1	36	admin	1	1	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	80	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
22	41	1	under graduate	60000	5	12000	1	66	weld shop	1	2	1	1	4	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	150	100	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
23	37	1	under graduate	100000	5	20000	1	48	production	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
24	27	1	under graduate	20000	4	5000	2	72	admin	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
25	25	1	under graduate	18000	4	4500	2	36	plant engineer	1	1	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	80	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
26	27	1	diploma	18000	4	4500	2	60	admin	1	1	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1
27	30	1	diploma	26000	4	6500	1	42	plant engineer	1	2	2	1	4	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	104	70	1	1	1	1	1	1	1	1	20	20	1	1	2	1	1	1	1	1	1	1	1
28	28	1	diploma	10000	3	3333.33	2	48	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	1	2	1	2	1	2	2	1	1	2	1	2	1	116	70	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
29	26	1	diploma	17000	3	5666.67	2	4	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	1	2	2	1	1	2	2	1	1	2	1	2	1	114	70	1	1	1	1	1	1	1	1	20	20	1	1	2	1	1	1	1	1	1	1	1
30	22	1	diploma	11000	3	3666.67	2	60	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	130	70	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
31	24	1	under graduate	85000	4	21250	1	3	plant engineer	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	124	76	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
32	23	1	diploma	13000	4	3250	2	2	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1
33	22	1	under graduate	11000	3	3666.67	2	48	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
34	22	1	under graduate	11000	3	3666.67	2	12	plant engineer	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	25	20	1	1	2	2	1	1	1	1	1	1	1
35	23	1	under graduate	11000	3	3666.67	2	24	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	20	25	1	1	1	1	1	1	1	1	1	1	1
36	22	1	under graduate	11000	4	2750	3	12	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	80	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
37	23	1	diploma	11850	4	2962.5	2	120	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	64	1	1	1	1	1	1	1	1	20	18	1	1	1	1	1	1	1	1	1	1	1

Participant ID	Age	Sex	Education	Monthly Income	Family Members	Percapita Income	Socioeconomic Status	Work Experience	Type of Job	Shift Work	Preplacement Audiogram	Periodical Audiogram	Noise exposure -Previous working station	Noise exposure exposure duration	hypertension history	duration of hypertension	History Eardischarge	Duration ED	History Ear pain	Duration Earpain	History Ear trauma	Family History HOH	Ototoxic drugintake SM Quinine	Sleeping Disturbance	Giddiness	Fatiguability	Vision_problems	Stress_Tension	Palpitation	Headache	Non_auditory_effects	Provision_HPD	Ear_Muff	Ear_Plug	Ear_canal_cap	Reason_Not_using_HPD	Systolic_BP	Diastolic_BP	Medical Examination HTN	External Ear Abnormal Left	Ear_Discharge_Rt	Ear_Discharge_Lt	Ear_WAX_Rt	Ear_WAX_Lt	Ear_Drum_RT	Ear_Drum_LT	Audiogram_Done	PTA_Rt_Ear	PTA_Lt_Ear	PTA_RT	PTA_LT	Dip_4khz-Rt	Dip_4khz_Lt	SNHL_RT	SNHL_LT	COHL_RT	COHL_LT	MIXED_HL_RT	MIXED_HL_LT	Hearing Loss
38	23	1	diploma	10000	4	2500	3	18	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	80	1	1	1	1	1	1	1	1	1	20	20	1	1	2	1	1	1	1	1	1	1	1
39	23	1	diploma	13000	2	6500	1	84	weld shop	1	2	1	2	0	1	1	2	0	2	0	2	2	2	2	2	2	2	2	2	1	2	1	2	1	170	80	1	1	1	1	1	1	1	1	1	18	20	1	1	1	2	1	1	1	1	1	1	1
40	30	1	Uneducated	7800	3	2600	3	30	tear down	1	2	2	2	0	2	1	2	0	2	0	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	70	1	1	1	1	1	1	3	1	1	40	23	2	1	2	2	2	1	1	1	1	1	1
41	23	1	diploma	8500	2	4250	2	48	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	3	2	3	2	5	110	64	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
42	25	1	diploma	10000	2	5000	2	60	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
43	27	1	diploma	10000	3	3333.33	2	36	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
44	22	1	under graduate	11000	2	5500	2	6	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	3	2	3	2	5	100	70	1	1	1	1	1	1	1	1	1	1	20	18	1	1	1	1	1	1	1	1	1	1	1
45	22	1	diploma	8000	3	2666.67	3	3	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1
46	22	1	under graduate	8000	3	2666.67	3	36	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	3	2	3	2	5	110	74	1	1	1	1	1	1	1	1	1	1	18	20	1	1	1	1	1	1	1	1	1	1	1
47	25	1	under graduate	14500	3	4833.33	2	48	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1
48	25	1	under graduate	10750	3	3583.33	2	12	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
49	28	1	diploma	11800	3	3933.33	2	48	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	114	70	1	1	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1
50	26	1	diploma	18000	4	4500	2	2	press shop	1	1	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	2	2	2	120	70	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
51	22	1	diploma	12000	4	3000	2	54	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	114	70	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
52	27	1	diploma	17000	3	5666.67	2	2	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	1	18	20	1	1	1	1	1	1	1	1	1	1	1
53	23	1	under graduate	11000	4	2750	3	24	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	1	2	1	1	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1	1
54	23	1	under graduate	11000	4	2750	3	60	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	1	1	1	2	1	2	1	126	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1	1
55	22	1	Uneducated	7800	3	2600	3	24	tear down	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	1	25	30	1	2	2	2	1	2	1	1	1	1	1
56	19	1	middle	7800	3	2600	3	2	tear down	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	110	74	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
57	25	1	middle	7800	3	2600	3	12	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	2	2	3	120	80	1	1	1	1	1	1	1	1	1	1	23	20	1	1	2	2	1	1	1	1	1	1	1
58	24	1	Uneducated	7800	3	2600	3	60	tear down	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	114	70	1	1	1	1	1	1	1	1	1	1	33	40	2	2	1	1	2	2	1	1	1	1	2
59	24	1	diploma	15000	4	3750	2	9	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
60	21	1	middle	7800	4	1950	3	12	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	120	70	1	1	1	1	1	1	1	1	1	1	25	35	1	2	1	1	1	2	1	1	1	1	1
61	21	1	high	7800	3	2600	3	24	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
62	23	1	middle	7800	3	2600	3	4	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	130	80	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
63	22	1	middle	7800	4	1950	3	60	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	130	80	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
64	21	1	middle	7800	4	1950	3	12	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	2	2	3	120	80	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
65	19	1	middle	7800	3	2600	3	168	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
66	22	1	Primary	12000	4	4000	2	144	tear down	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
67	26	1	middle	7800	3	1950	3	36	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
68	21	1	middle	7800	3	2600	3	3	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
69	21	1	Uneducated	7500	3	2500	3	96	tear down	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	2	2	4	100	70	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
70	20	1	middle	7800	3	2600	3	60	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
71	19	1	high	7500	4	2500	3	24	press shop	1	2	2	2	0	2	0	1	2	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	2	1	1	1	3	1	1	31	25	2	1	1	1	1	1	2	1	1	1	1	1
72	20	1	middle	7500	4	1875	3	12	press shop	1	2	2	2	0	2	0	1	2	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	100	74	1	1	1	2	1	1	1	3	1	20	40	1	2	1	1	1	1	2	1	1	1	1	1
73	21	1	high	7500	3	1875	3	72	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	1	18	20	1	1	1	1	1	1	1	1	1	1	1
74	20	1	high	7500	3	2500	3	8	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	100	66	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
75	19	1	high	7500	4	2500	3	48	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	1	2	1	2	1	106	74	1	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1

Participant ID	Age	Sex	Education	Monthly Income	Family Members	Percapita Income	Socioeconomic Status	Work Experience	Type of Job	Shift Work	Preplacement Audiogram	Periodical Audiogram	Noise exposure -Previous working station	Noise exposure exposure duration	hypertension history	duration of hypertension	History Eardischarge	Duration ED	History Ear pain	Duration Earpain	History Ear trauma	Family History HOH	Ototoxic drugintake SM Quinine	Sleeping Disturbance	Giddiness	Fatiguability	Vision_problems	Stress_Tension	Palpitation	Headache	Non_auditory_effects	Provision_HPD	Ear_Muff	Ear_Plug	Ear_canal_cap	Reason_Not_using_HPD	Systolic_BP	Diastolic_BP	Medical Examination HTN	External Ear Abnormal Left	Ear_Discharge_Rt	Ear_Discharge_Lt	Ear_WAX_Rt	Ear_WAX_Lt	Ear_Drum_RT	Ear_Drum_LT	Audiogram_Done	PTA_Rt_Ear	PTA_Lt_Ear	PTA_RT	PTA_LT	Dip_4khz-Rt	Dip_4khz_Lt	SNHL_RT	SNHL_LT	COHL_RT	COHL_LT	MIXED_HL_RT	MIXED_HL_LT	Hearing Loss
76	19	1	middle	7500	5	1875	3	30	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
77	39	1	middle	7500	4	1500	4	4	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	100	74	1	1	1	1	1	1	1	1	1	30	28	2	2	1	1	2	2	1	1	1	1	2
78	30	1	post graduate	56000	4	14000	1	48	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	1	20	23	1	1	1	1	1	1	1	1	1	1	1
79	36	1	under graduate	26000	4	6500	1	24	plant store	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	80	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
80	23	1	diploma	7000	4	1750	3	2	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	1	1	1	1	2	1	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
81	30	1	diploma	35000	2	8750	1	18	plant engineer	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	18	1	1	2	1	1	1	1	1	1	1	1
82	21	1	under graduate	11000	4	5500	2	36	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	18	16	1	1	1	1	1	1	1	1	1	1	1
83	28	1	post graduate	35000	5	8750	1	60	plant engineer	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
84	52	1	under graduate	50000	5	10000	1	12	plant engineer	1	2	2	2	0	1	10	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	4	120	84	1	1	1	1	1	1	1	1	1	28	28	2	2	1	1	2	2	1	1	1	1	2
85	26	2	post graduate	28000	4	5600	2	42	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	100	70	1	1	1	1	1	1	1	1	1	20	21	1	1	1	1	1	1	1	1	1	1	1
86	26	1	diploma	12500	3	3125	2	48	weld shop	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	25	20	1	1	2	2	1	1	1	1	1	1	1
87	29	1	diploma	18000	4	6000	2	12	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	1	2	2	2	1	1	1	2	1	2	1	100	70	1	1	1	1	1	1	1	5	1	20	28	1	2	2	2	1	1	1	2	1	1	1
88	23	1	under graduate	12000	5	3000	2	36	press shop	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
89	26	1	under graduate	15000	5	3000	2	84	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	3	114	70	1	1	1	1	1	1	1	1	1	20	25	1	1	2	1	1	1	1	1	1	1	1
90	35	1	post graduate	15000	6	3000	2	48	plant hr	1	1	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	1	1	1	1	1	1	1	1
91	37	1	under graduate	20000	4	3333.33	2	65	security	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	1	2	1	2	1	1	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	1	20	30	1	2	1	1	1	1	1	2	1	1	1
92	24	1	under graduate	9300	6	2325	3	84	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	100	70	1	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1
93	44	1	post graduate	60000	6	10000	1	36	plant manager	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	140	90	2	1	1	1	1	1	1	5	1	20	20	1	1	2	1	1	1	1	1	1	1	1
94	36	1	post graduate	150000	4	25000	1	36	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	4	1	20	25	1	1	2	2	1	1	1	1	1	1	1
95	38	1	under graduate	15000	3	3750	2	18	fork lift supervisor	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	28	25	2	1	1	1	2	1	1	1	1	1	1
96	22	1	higher secondary	11500	4	3833.33	2	108	fork lift driver	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
97	26	1	diploma	18000	4	4500	2	60	assitant plant engineer	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
98	24	1	under graduate	11000	3	2750	3	60	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	18	20	1	1	1	2	1	1	1	1	1	1	1
99	28	1	diploma	33000	4	11000	1	5	plant engineer	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	18	1	1	2	2	1	1	1	1	1	1	1
100	32	1	diploma	70000	5	17500	1	1	plant manager	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	25	23	1	1	1	1	1	1	1	1	1	1	1
101	32	1	post graduate	45000	4	9000	1	60	plant assitant manager	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	18	1	1	1	1	1	1	1	1	1	1	1
102	23	1	under graduate	17000	4	4250	2	6	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1
103	24	1	post graduate	17000	6	4250	2	180	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1
104	48	1	under graduate	100000	5	16666.67	1	36	plant manager	1	1	2	2	0	1	5	2	0	2	0	2	2	2	1	1	1	1	1	1	1	1	1	2	1	2	1	154	100	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
105	35	1	post graduate	50000	4	10000	1	12	purchase dept	1	1	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
106	23	1	under graduate	11000	4	2750	3	24	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	100	70	1	1	1	1	1	1	1	1	1	18	20	1	1	1	1	1	1	1	1	1	1	1
107	33	1	under graduate	50000	4	12500	1	48	admin	1	1	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	5	1	23	31	1	2	1	1	1	1	1	2	1	1	1
108	25	1	diploma	16000	5	4000	2	72	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
109	26	1	diploma	18000	3	3600	2	5	weld shop	1	2	2	1	2	2	0	2	0	2	0	2	2	2	1	2	2	2	2	1	1	1	2	1	2	1	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
110	18	1	diploma	10500	4	3500	2	51	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
111	33	1	higher secondary	11600	4	2900	3	6	fork lift driver	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	100	1	1	1	1	1	1	1	1	1	20	23	1	1	2	2	1	1	1	1	1	1	1
112	21	1	middle	7500	2	1875	3	36	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	26	25	2	1	1	1	2	1	1	1	1	1	1
113	20	1	middle	7500	2	3750	2	7	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	46	28	3	2	1	1	1	2	1	1	3	1	2

Participant ID	Age	Sex	Education	Monthly Income	Family Members	Percapita Income	Socioeconomic Status	Work Experience	Type of Job	Shift Work	Preplacement Audiogram	Periodical Audiogram	Noise exposure -Previous working station	Noise exposure exposure duration	hypertension history	duration of hypertension	History Eardischarge	Duration ED	History Ear pain	Duration Earpain	History Ear trauma	Family History HOH	Ototoxic drugintake SM Quinine	Sleeping Disturbance	Giddiness	Fatiguability	Vision_problems	Stress_Tension	Palpitation	Headache	Non_auditory_effects	Provision_HPD	Ear_Muff	Ear_Plug	Ear_canal_cap	Reason_Not_using_HPD	Systolic_BP	Diastolic_BP	Medical Examination HTN	External Ear Abnormal Left	Ear_Discharge_Rt	Ear_Discharge_Lt	Ear_WAX_Rt	Ear_WAX_Lt	Ear_Drum_RT	Ear_Drum_LT	Audiogram_Done	PTA_Rt_Ear	PTA_Lt_Ear	PTA_RT	PTA_LT	Dip_4khz-Rt	Dip_4khz_Lt	SNHL_RT	SNHL_LT	COHL_RT	COHL_LT	MIXED_HL_RT	MIXED_HL_LT	Hearing Loss
114	22	1	high	7500	4	3750	2	6	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	106	70	1	1	1	1	1	1	1	1	1	20	18	1	1	1	1	1	1	1	1	1	1	1
115	28	1	iti	12000	4	3000	2	4	fork lift driver	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	80	1	1	1	1	1	1	1	1	1	20	26	1	2	2	1	1	2	1	1	1	1	1
116	26	1	under graduate	12000	4	3000	2	2	fork lift driver	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
117	31	1	high	12000	4	3000	2	12	fork lift driver	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
118	24	1	middle	11000	6	2750	3	18	fork lift driver	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	80	1	1	1	1	1	1	1	1	1	23	23	1	1	2	2	1	1	1	1	1	1	1
119	29	1	under graduate	50000	3	8333.33	1	4	plant engineer	1	1	2	1	6	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
120	38	1	middle	11500	4	3833.33	2	24	fork lift driver	1	2	2	1	5	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
121	32	1	diploma	50000	4	12500	1	48	plant assitant manager	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
122	37	1	diploma	30000	4	7500	1	6	assitant manager welding	1	1	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
123	22	1	high	7500	5	1875	3	5	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	106	70	1	1	1	1	1	1	1	1	1	18	20	1	1	1	1	1	1	1	1	1	1	1
124	56	1	post graduate	100000	4	20000	1	24	plant manager	1	2	2	1	5	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	140	90	2	1	1	1	1	1	1	1	1	20	26	1	2	1	1	1	2	1	1	1	1	1
125	19	1	Uneducated	7500	4	1875	3	8	tear down	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	116	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
126	22	1	high	7500	3	1875	3	1	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	118	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
127	22	1	Uneducated	7500	4	2500	3	2	tear down	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	116	70	1	1	1	1	1	1	1	5	1	20	30	1	2	1	1	1	1	2	1	1	1	1
128	25	1	high	7500	4	1875	3	1	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	26	30	2	2	1	1	2	2	1	1	1	1	2
129	27	1	diploma	19000	4	4750	2	12	plant engineer	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
130	35	1	under graduate	50000	3	12500	1	6	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
131	24	1	diploma	16000	4	5333.33	2	36	press shop	1	1	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
132	34	1	high	10000	4	2500	3	86	ambulance driver	1	2	2	2	3	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	100	80	1	1	1	1	1	1	1	1	1	30	30	2	2	1	1	2	2	1	1	1	1	2
133	34	1	middle	11000	4	2750	3	18	fork lift driver	1	2	2	1	2	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	80	1	1	1	1	1	1	1	1	1	21	20	1	1	2	2	1	1	1	1	1	1	1
134	30	1	iti	15000	5	3750	2	48	fork lift driver	1	2	2	1	6	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	90	2	1	1	1	1	1	1	1	1	23	30	1	2	1	1	1	1	1	1	1	1	1
135	29	1	middle	12000	3	2400	3	18	fork lift driver	1	2	2	1	2	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	80	1	1	1	1	1	1	1	1	1	25	25	1	1	2	2	1	1	1	1	1	1	1
136	23	1	diploma	10000	4	3333.33	2	18	fork lift driver	1	2	2	1	1	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
137	23	1	diploma	10000	4	2500	3	2	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	1	20	18	1	1	1	1	1	1	1	1	1	1	1
138	25	1	higher secondary	7500	4	1875	3	3	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	60	1	1	1	1	1	1	1	1	1	26	28	2	2	1	1	1	1	2	2	1	1	2
139	24	1	under graduate	7500	3	1875	3	42	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	23	25	1	1	1	1	1	1	1	1	1	1	1
140	21	1	diploma	8000	4	2666.67	3	30	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	80	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
141	26	1	under graduate	27000	4	6750	1	12	paint shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
142	20	1	high	10000	4	2500	3	12	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
143	23	1	higher secondary	7800	3	1950	3	1	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
144	21	1	diploma	17000	4	5666.67	2	30	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
145	24	1	Primary	11500	4	2875	3	18	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
146	25	1	diploma	8000	4	2000	3	24	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1
147	21	1	middle	9000	3	2250	3	18	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
148	21	1	iti	7000	4	2333.33	3	6	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
149	22	1	diploma	9500	5	2375	3	1	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
150	36	1	Uneducated	20000	3	4000	2	3	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	28	1	2	2	2	1	1	1	1	1	1	1
151	25	1	diploma	8000	3	2666.67	3	3	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1

Participant ID	Age	Sex	Education	Monthly Income	Family Members	Percapita Income	Socioeconomic Status	Work Experience	Type of Job	Shift Work	Preplacement Audiogram	Periodical Audiogram	Noise exposure -Previous working station	Noise exposure exposure duration	hypertension history	duration of hypertension	History Eardischarge	Duration ED	History Ear pain	Duration Earpain	History Ear trauma	Family History HOH	Ototoxic drugintake SM Quinine	Sleeping Disturbance	Giddiness	Fatiguability	Vision_problems	Stress_Tension	Palpitation	Headache	Non_auditory_effects	Provision_HPD	Ear_Muff	Ear_Plug	Ear_canal_cap	Reason_Not_using_HPD	Systolic_BP	Diastolic_BP	Medical Examination HTN	External Ear Abnormal Left	Ear_Discharge_Rt	Ear_Discharge_Lt	Ear_WAX_Rt	Ear_WAX_Lt	Ear_Drum_RT	Ear_Drum_LT	Audiogram_Done	PTA_Rt_Ear	PTA_Lt_Ear	PTA_RT	PTA_LT	Dip_4khz-Rt	Dip_4khz_Lt	SNHL_RT	SNHL_LT	COHL_RT	COHL_LT	MIXED_HL_RT	MIXED_HL_LT	Hearing Loss
152	25	1	diploma	7500	2	2500	3	20	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
153	23	1	diploma	7000	2	3500	2	3	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
154	21	1	under graduate	7000	3	3500	2	1	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
155	22	1	diploma	8500	4	2833.33	3	12	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1
156	21	1	diploma	8500	4	2125	3	12	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	18	20	1	1	1	1	1	1	1	1	1	1	1
157	20	1	middle	7500	4	1875	3	48	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
158	26	1	diploma	9500	3	2375	3	1	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
159	20	1	diploma	7500	4	2500	3	4	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
160	22	1	under graduate	8500	4	2125	3	24	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
161	23	1	diploma	7500	3	1875	3	9	paint shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	1	1	1	1	1	1	1	1
162	20	1	diploma	7500	3	2500	3	5	paint shop	1	2	2	1	1	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
163	23	1	diploma	8000	3	2666.67	3	54	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
164	21	1	diploma	8000	4	2666.67	3	120	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
165	29	1	diploma	10000	3	2500	3	72	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
166	20	1	middle	7800	4	2600	3	84	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
167	26	1	middle	7800	4	1950	3	132	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
168	23	1	high	15000	4	3750	2	18	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
169	27	1	Uneducated	7800	4	1950	3	1	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
170	22	1	diploma	9000	5	2250	3	1	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
171	30	1	middle	7000	4	1400	4	2	press shop	1	2	2	1	3	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	30	1	2	2	2	1	2	1	1	1	1	1
172	22	1	high	10000	3	2500	3	24	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
173	21	1	under graduate	7500	4	2500	3	24	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	1	1	1	1	1	1	1	1
174	24	1	diploma	8000	3	2000	3	1	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
175	22	1	under graduate	7500	4	2500	3	48	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	18	1	1	1	1	1	1	1	1	1	1	1
176	29	1	higher secondary	10000	4	2500	3	4	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	5	5	1	56	61	4	4	1	1	1	1	3	4	1	1	2
177	21	1	higher secondary	7000	4	1750	3	1	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	26	25	2	1	1	1	2	1	1	1	1	1	1
178	25	1	middle	7800	4	1950	3	24	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	21	1	1	1	1	1	1	1	1	1	1	1
179	24	1	under graduate	7400	4	1850	3	4	plant engineer	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	4	1	1	1	1	1
180	25	1	under graduate	8000	4	2000	3	7	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	30	21	2	1	1	1	2	1	1	1	1	1	1
181	22	1	middle	8000	3	2000	3	18	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
182	18	1	iti	8000	3	2666.67	3	24	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1
183	42	1	Primary	7800	4	2600	3	18	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	84	1	1	1	2	1	1	1	3	1	36	40	2	2	1	1	1	1	2	2	1	1	2
184	22	1	diploma	8500	2	2125	3	36	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	150	80	1	1	1	1	1	1	1	1	1	25	25	1	1	2	2	1	1	1	1	1	1	1
185	23	1	middle	7000	3	3500	2	36	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	2	1	1	5	1	1	38	28	2	2	1	1	1	1	2	2	1	1	2
186	22	1	under graduate	7400	3	2466.67	3	1	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	23	20	1	1	1	1	1	1	1	1	1	1	1
187	31	1	higher secondary	9000	4	3000	2	2	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	80	1	1	1	1	1	1	5	5	1	40	28	2	2	1	2	1	2	1	1	2	1	2
188	25	1	higher secondary	7000	4	1750	3	6	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	84	1	1	1	1	1	1	1	1	1	26	28	2	2	1	1	2	2	1	1	1	1	2
189	28	1	middle	7000	5	1750	3	2	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1

Participant ID	Age	Sex	Education	Monthly Income	Family Members	Percapita Income	Socioeconomic Status	Work Experience	Type of Job	Shift Work	Preplacement Audiogram	Periodical Audiogram	Noise exposure -Previous working station	Noise exposure exposure duration	hypertension history	duration of hypertension	History Eardischarge	Duration ED	History Ear pain	Duration Earpain	History Ear trauma	Family History HOH	Ototoxic drugintake SM Quinine	Sleeping Disturbance	Giddiness	Fatiguability	Vision_problems	Stress_Tension	Palpitation	Headache	Non_auditory_effects	Provision_HPD	Ear_Muff	Ear_Plug	Ear_canal_cap	Reason_Not_using_HPD	Systolic_BP	Diastolic_BP	Medical Examination HTN	External Ear Abnormal Left	Ear_Discharge_Rt	Ear_Discharge_Lt	Ear_WAX_Rt	Ear_WAX_Lt	Ear_Drum_RT	Ear_Drum_LT	Audiogram_Done	PTA_Rt_Ear	PTA_Lt_Ear	PTA_RT	PTA_LT	Dip_4khz-Rt	Dip_4khz_Lt	SNHL_RT	SNHL_LT	COHL_RT	COHL_LT	MIXED_HL_RT	MIXED_HL_LT	Hearing Loss
190	32	1	Primary	7500	4	1500	4	4	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	25	28	1	2	1	1	1	2	1	1	1	1	1	1
191	20	1	diploma	7400	3	1850	3	10	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	76	1	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1	1
192	23	1	diploma	7400	4	2466.67	3	15	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1	1
193	43	1	post graduate	80000	4	20000	1	54	admin	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	1	1	31	28	2	2	2	1	1	2	1	1	1	1	1	2
194	40	1	under graduate	70000	4	17500	1	12	plant engineer	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	64	1	1	1	1	1	1	1	1	1	25	25	1	1	2	2	1	1	1	1	1	1	1	1
195	45	1	under graduate	40000	4	10000	1	12	plant engineer	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	140	96	2	1	1	1	1	1	1	1	1	28	30	2	2	1	2	2	2	1	1	1	1	1	2
196	37	1	diploma	55000	4	13750	1	4	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	80	1	1	1	1	1	1	1	1	1	21	21	1	1	2	2	1	1	1	1	1	1	1	1
197	41	1	higher secondary	8500	3	2125	3	4	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	150	90	2	1	1	1	1	1	1	1	1	35	26	2	2	1	1	2	2	1	1	1	1	1	2
198	23	1	under graduate	7500	4	2500	3	1	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	25	28	1	2	1	1	1	2	1	1	1	1	1	1
199	37	1	under graduate	65000	4	16250	1	48	plant engineer	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	124	80	1	1	1	1	1	1	1	1	1	23	25	1	1	2	2	1	1	1	1	1	1	1	1
200	35	1	diploma	60000	4	15000	1	60	weld shop	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1	1
201	29	1	post graduate	30000	4	7500	1	1	plant engineer	1	1	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	25	1	1	1	2	1	1	1	1	1	1	1	1
202	31	1	post graduate	50000	4	12500	1	1	plant engineer	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1	1
203	28	1	under graduate	42000	4	10500	1	42	plant engineer	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	21	1	1	1	2	1	1	1	1	1	1	1	1
204	37	1	diploma	50000	3	12500	1	10	plant engineer	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	80	1	1	1	1	1	1	1	5	1	20	45	1	3	2	1	1	1	1	1	1	1	3	1
205	23	1	diploma	8000	3	2666.67	3	51	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	116	70	1	1	1	1	1	1	1	1	1	20	18	1	1	1	1	1	1	1	1	1	1	1	1
206	24	1	diploma	8000	3	2666.67	3	12	paint shop	1	2	2	1	2	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	114	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1	1
207	28	1	middle	17000	3	5666.67	2	60	driver	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	114	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1	1
208	34	1	under graduate	60000	4	20000	1	12	paint shop	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1	1
209	29	1	under graduate	45000	4	11250	1	12	admin	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1	1
210	24	1	iti	10000	4	2500	3	18	weld shop	1	2	1	1	2	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1	1
211	37	1	high	7500	4	1875	3	48	weld shop	1	2	2	1	1	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	23	1	1	2	2	1	1	1	1	1	1	1	1
212	32	1	under graduate	29000	3	7250	1	36	weld shop	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	84	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1	1
213	37	1	high	10000	4	3333.33	2	36	weld shop	1	2	2	1	5	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	136	96	2	1	1	1	1	1	1	1	1	20	25	1	1	2	2	1	1	1	1	1	1	1	1
214	25	1	high	20000	4	5000	2	36	weld shop	1	2	2	1	2	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	23	25	1	1	2	2	1	1	1	1	1	1	1	1
215	25	1	higher secondary	11000	4	2750	3	60	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	116	80	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1	1
216	24	1	high	10000	4	2500	3	5	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	116	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1	1
217	33	2	post graduate	50000	4	12500	1	12	admin	1	2	1	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	1	21	21	1	1	1	1	1	1	1	1	1	1	1	1
218	40	2	under graduate	50000	4	12500	1	18	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1	1
219	20	1	diploma	7500	4	1875	3	12	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	1	1	1	1	1	1	1	1	1
220	35	1	under graduate	54000	3	13500	1	16	plant engineer	1	2	1	1	3	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	80	1	1	1	1	1	1	1	1	1	63	48	4	3	1	1	4	3	1	1	1	1	1	2
221	24	1	high	12000	2	4000	2	2	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	126	80	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1	1
222	19	1	high	8000	2	4000	2	12	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	114	70	1	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1	1
223	20	1	Uneducated	7000	3	3500	2	12	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1	1
224	18	1	high	12000	3	4000	2	36	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1	1
225	22	1	high	7000	3	2333.33	3	24	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	18	18	1	1	1	1	1	1	1	1	1	1	1	1
226	22	1	diploma	7400	3	2466.67	3	2	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	116	70	1	1	1	1	1	1	1	1	1	18	20	1	1	1	1	1	1	1	1	1	1	1	1
227	30	1	middle	7000	4	2333.33	3	12	assembling	1	2	2	1	1	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	74	1	1	1	1	1	1	1	1	1	35	31	2	2	2	2	2	2	1	1	1	1	1	2

Participant ID	Age	Sex	Education	Monthly Income	Family Members	Percapita Income	Socioeconomic Status	Work Experience	Type of Job	Shift Work	Preplacement Audiogram	Periodical Audiogram	Noise exposure -Previous working station	Noise exposure exposure duration	hypertension history	duration of hypertension	History Eardischarge	Duration ED	History Ear pain	Duration Earpain	History Ear trauma	Family History HOH	Ototoxic drugintake SM Quinine	Sleeping Disturbance	Giddiness	Fatiguability	Vision_problems	Stress_Tension	Palpitation	Headache	Non_auditory_effects	Provision_HPD	Ear_Muff	Ear_Plug	Ear_canal_cap	Reason_Not_using_HPD	Systolic_BP	Diastolic_BP	Medical Examination HTN	External Ear Abnormal Left	Ear_Discharge_Rt	Ear_Discharge_Lt	Ear_WAX_Rt	Ear_WAX_Lt	Ear_Drum_RT	Ear_Drum_LT	Audiogram_Done	PTA_Rt_Ear	PTA_Lt_Ear	PTA_RT	PTA_LT	Dip_4khz-Rt	Dip_4khz_Lt	SNHL_RT	SNHL_LT	COHL_RT	COHL_LT	MIXED_HL_RT	MIXED_HL_LT	Hearing Loss
228	22	1	high	7500	4	1875	3	1	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	76	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
229	18	1	high	7000	4	1750	3	5	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
230	23	1	diploma	7000	4	1750	3	24	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
231	30	1	high	8000	4	2000	3	4	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	33	28	2	2	1	1	2	2	1	1	1	1	2
232	26	1	diploma	8500	3	2125	3	5	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	80	1	1	1	1	1	1	1	1	1	20	20	1	1	1	2	1	1	1	1	1	1	1
233	19	1	middle	7800	3	2600	3	5	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
234	24	1	high	7000	4	1750	3	12	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
235	35	1	high	7000	3	2333.33	3	12	assembling	No	2	2	1	3	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	70	1	1	1	1	1	1	1	1	1	25	25	1	1	2	2	1	1	1	1	1	1	1
236	36	1	middle	7000	4	1750	3	120	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	25	23	1	1	1	1	1	1	1	1	1	1	1
237	30	1	high	7000	3	2333.33	3	1	weld shop	No	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	21	30	1	2	2	2	1	2	1	1	1	1	1
238	37	1	iti	10000	3	3333.33	2	144	plant engineer	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	3	1	1	28	26	2	2	1	1	2	2	1	1	1	1	2
239	20	1	high	7000	3	2333.33	3	24	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	18	1	1	1	1	1	1	1	1	1	1	1
240	28	1	high	7000	3	2333.33	3	3	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
241	20	1	middle	7000	4	1750	3	4	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	18	16	1	1	1	1	1	1	1	1	1	1	1
242	23	1	middle	7000	4	1750	3	48	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
243	26	1	middle	7000	4	1750	3	6	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	21	1	1	2	2	1	1	1	1	1	1	1
244	21	1	diploma	7500	4	1875	3	9	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	124	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
245	21	1	diploma	7500	4	1875	3	36	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	28	26	2	2	1	1	2	2	1	1	1	1	2
246	25	1	under graduate	7500	3	2500	3	24	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	2	1	1	1	1	1	1	1	1
247	23	1	middle	7500	4	1875	3	30	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
248	22	1	middle	7000	3	2333.33	3	36	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
249	26	1	diploma	7500	3	2500	3	18	assembling	1	2	2	1	1	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	20	1	1	2	1	1	1	1	1	1	1	1
250	18	1	iti	7000	4	1750	3	24	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
251	37	1	high	6000	4	1500	4	10	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	150	100	1	1	1	1	1	1	1	1	1	38	36	2	2	1	1	2	2	1	1	1	1	2
252	32	1	post graduate	40000	4	10000	1	6	safety officer	1	2	2	1	4	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	80	1	1	1	1	1	1	1	1	1	20	20	1	1	2	2	1	1	1	1	1	1	1
253	24	1	middle	8000	3	2666.67	3	9	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	20	18	1	1	1	1	1	1	1	1	1	1	1
254	21	1	high	7000	4	1750	3	30	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	20	20	1	1	1	1	1	1	1	1	1	1	1
255	23	1	high	7000	4	1750	3	60	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	20	21	1	1	1	1	1	1	1	1	1	1	1
256	43	1	under graduate	60000	4	15000	1	18	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	3	2	3	2	5	140	100	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
257	35	1	high	7400	4	1850	3	60	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
258	25	1	diploma	7500	4	1875	3	36	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	60	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
259	32	1	high	8000	4	2000	3	48	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
260	36	1	middle	8000	4	2000	3	36	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
261	38	1	high	10000	4	2500	3	36	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
262	29	1	high	9000	4	2250	3	36	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	116	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
263	37	1	middle	7800	4	1950	3	48	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	22	22	1	1	1	1	1	1	1	1	1	1	1
264	28	1	high	9000	4	2250	3	36	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	90	2	1	1	1	1	1	1	1	1	25	24	1	1	1	1	1	1	1	1	1	1	1
265	27	1	high	8000	4	2000	3	48	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1

Participant ID	Age	Sex	Education	Monthly Income	Family Members	Percapita Income	Socioeconomic Status	Work Experience	Type of Job	Shift Work	Preplacement Audiogram	Periodical Audiogram	Noise exposure -Previous working station	Noise exposure exposure duration	hypertension history	duration of hypertension	History Eardischarge	Duration ED	History Ear pain	Duration Earpain	History Ear trauma	Family History HOH	Ototoxic drugintake SM Quinine	Sleeping Disturbance	Giddiness	Fatiguability	Vision_problems	Stress_Tension	Palpitation	Headache	Non_auditory_effects	Provision_HPD	Ear_Muff	Ear_Plug	Ear_canal_cap	Reason_Not_using_HPD	Systolic_BP	Diastolic_BP	Medical Examination HTN	External Ear Abnormal Left	Ear_Discharge_Rt	Ear_Discharge_Lt	Ear_WAX_Rt	Ear_WAX_Lt	Ear_Drum_RT	Ear_Drum_LT	Audiogram_Done	PTA_Rt_Ear	PTA_Lt_Ear	PTA_RT	PTA_LT	Dip_4khz-Rt	Dip_4khz_Lt	SNHL_RT	SNHL_LT	COHL_RT	COHL_LT	MIXED_HL_RT	MIXED_HL_LT	Hearing Loss
266	34	1	high	9000	5	1800	3	36	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	74	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
267	34	1	middle	9000	4	2250	3	3	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	100	70	1	1	1	1	1	1	1	1	1	24	25	1	1	1	1	1	1	1	1	1	1	1
268	46	1	Primary	9000	4	2250	3	1	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
269	27	1	middle	8400	4	2100	3	2	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
270	32	1	high	9000	4	2250	3	2	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
271	39	1	diploma	9500	4	2375	3	6	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	124	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
272	28	1	diploma	23000	4	5750	2	2	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	100	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
273	25	1	diploma	18000	4	4500	2	12	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	1	1	23	23	1	1	1	1	1	1	1	1	1	1	1
274	27	1	diploma	11000	4	2750	3	6	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
275	31	1	high	9000	4	2250	3	12	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
276	24	1	diploma	8000	4	2000	3	30	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
277	29	1	high	9000	4	2250	3	12	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
278	29	1	diploma	17000	4	4250	2	24	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
279	25	1	high	9000	4	2250	3	60	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
280	24	1	under graduate	27000	3	9000	1	5	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
281	41	1	middle	11000	3	3666.67	2	48	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
282	38	1	diploma	11000	4	2750	3	18	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
283	36	1	diploma	11000	4	2750	3	18	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	2	2	1	1	1	1	1	1	1
284	39	1	middle	9500	3	3166.67	2	3	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
285	32	1	middle	9000	4	2250	3	4	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	70	1	1	1	1	1	1	1	1	1	24	24	1	1	1	2	1	1	1	1	1	1	1
286	34	1	high	8000	4	2000	3	180	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
287	38	1	high	7500	3	2500	3	6	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
288	34	1	middle	7500	4	1875	3	4	weld shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
289	33	1	under graduate	36000	4	9000	1	24	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	1	1	23	23	1	1	1	1	1	1	1	1	1	1	1
290	32	1	diploma	18000	4	4500	2	16	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	1	23	23	1	1	1	1	1	1	1	1	1	1	1
291	35	1	under graduate	40000	4	10000	1	72	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	70	1	1	1	1	1	1	1	1	1	23	25	1	1	1	1	1	1	1	1	1	1	1
292	34	1	diploma	11000	4	2750	3	6	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
293	36	1	diploma	11000	4	2750	3	24	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
294	37	1	under graduate	17000	4	4250	2	30	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
295	37	1	diploma	18000	4	4500	2	1	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
296	33	1	under graduate	26000	4	6500	1	12	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
297	36	1	diploma	13000	4	3250	2	180	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
298	35	1	high	11000	4	2750	3	48	assembling	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	23	22	1	1	1	1	1	1	1	1	1	1	1
299	33	1	middle	11000	4	2750	3	12	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
300	35	1	high	9000	4	2250	3	3	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
301	36	1	high	11000	3	3666.67	2	18	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
302	35	1	middle	11000	3	3666.67	2	40	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
303	35	1	middle	11000	3	3666.67	2	10	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	130	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1

Participant ID	Age	Sex	Education	Monthly Income	Family Members	Percapita Income	Socioeconomic Status	Work Experience	Type of Job	Shift Work	Preplacement Audiogram	Periodical Audiogram	Noise exposure -Previous working station	Noise exposure exposure duration	hypertension history	duration of hypertension	History Eardischarge	Duration ED	History Ear pain	Duration Earpain	History Ear trauma	Family History HOH	Ototoxic drugintake SM Quinine	Sleeping Disturbance	Giddiness	Fatiguability	Vision_problems	Stress_Tension	Palpitation	Headache	Non_auditory_effects	Provision_HPD	Ear_Muff	Ear_Plug	Ear_canal_cap	Reason_Not_using_HPD	Systolic_BP	Diastolic_BP	Medical Examination HTN	External Ear Abnormal Left	Ear_Discharge_Rt	Ear_Discharge_Lt	Ear_WAX_Rt	Ear_WAX_Lt	Ear_Drum_RT	Ear_Drum_LT	Audiogram_Done	PTA_Rt_Ear	PTA_Lt_Ear	PTA_RT	PTA_LT	Dip_4khz-Rt	Dip_4khz_Lt	SNHL_RT	SNHL_LT	COHL_RT	COHL_LT	MIXED_HL_RT	MIXED_HL_LT	Hearing Loss
304	37	1	post graduate	48000	4	12000	1	54	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
305	36	1	diploma	13000	4	3250	2	60	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
306	43	1	high	13000	4	3250	2	120	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
307	41	1	high	11000	3	3666.67	2	7	paint shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
308	37	1	high	13000	4	3250	2	7	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
309	40	1	post graduate	56000	4	14000	1	60	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	110	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
310	34	1	post graduate	70000	4	17500	1	48	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
311	34	1	post graduate	36000	5	7200	1	7	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	120	80	1	1	1	1	1	1	1	1	1	23	25	1	1	1	1	1	1	1	1	1	1	1
312	35	1	middle	11000	3	3666.67	2	84	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
313	37	1	high	13000	3	4333.33	2	12	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	120	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
314	34	1	under graduate	13000	4	3250	2	156	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	70	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1
315	35	1	post graduate	36000	4	9000	1	120	admin	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	5	130	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1	1	1	1	1	1	1
316	35	1	diploma	13000	4	3250	2	1	press shop	1	2	2	2	0	2	0	2	0	2	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	110	80	1	1	1	1	1	1	1	1	1	25	25	1	1	1	2	1	1	1	1	1	1	1

ANNEXURE-9

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI 600 003

EC Reg.No.ECR/270/Inst./TN/2013
Telephone No.044 25305301
Fax: 011 25363970

CERTIFICATE OF APPROVAL

To
Dr.E.S.Amarnath
II Year Post Graduate in MD Community Medicine
Institute of Community Medicine
Madras Medical College
Chennai 600 003

Dear Dr.E.S.Amarnath,

The Institutional Ethics Committee has considered your request and approved your study titled **"A CROSS SECTIONAL STUDY ON THE PREVALENCE OF HEARING LOSS AMONG AUTOMOBILE INDUSTRIAL WORKERS IN KANCHIPURAM DISTRICT TAMIL NADU 2017 " - NO.24022017 (II)**

The following members of Ethics Committee were present in the meeting hold on **21.02.2017** conducted at Madras Medical College, Chennai 3

1.Dr.C.Rajendran, MD.,	:Chairperson
2.Dr.M.K.Muralidharan,MS.,M.Ch.,Dean, MMC,Ch-3	:Deputy Chairperson
3.Prof.Sudha Seshayyan,MD., Vice Principal,MMC,Ch-3	: Member Secretary
4.Prof.B.Vasanthi,MD., Prof.of Pharmacology.,MMC,Ch-3	: Member
5.Prof.K.Ramadevi,MD.,Director,Inst.of Bio-Che,MMC,Ch-3	: Member
6.Tmt.J.Rajalakshmi, JAO,MMC, Ch-3	: Lay Person
7.Thiru S.Govindasamy, BA.,BL,High Court,Chennai	: Lawyer
8.Tmt.Arnold Saulina, MA.,MSW.,	:Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary - Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
CHENNAI-600 003